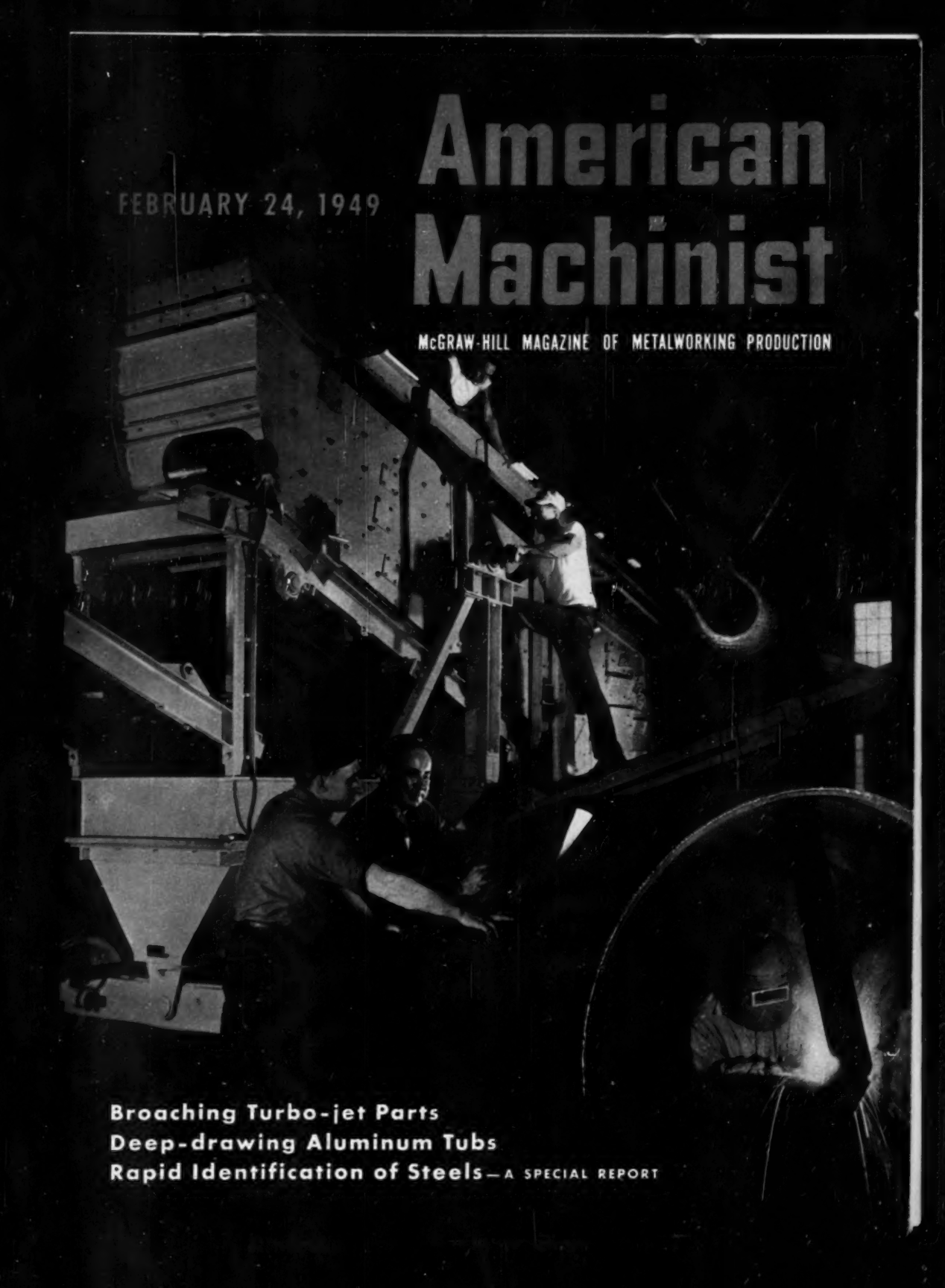
FEBRUARY 24, 1949

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Broaching Turbo-jet Parts
Deep-drawing Aluminum Tubs
Rapid Identification of Steels—A SPECIAL REPORT

KEEP YOUR PRECISION UNDER LOCK AND KEY!

On the New Heald machines you can lock your set-up as easily as you lock your car

There's nothing new about a lock. But there's a brand new advantage in being able to use locks on controls set for precision finishing equipment. Here's how the new Heald Bore-Matic and Grinders make it possible.

Simply dial your machine set-up on any new Heald machine, then turn the key—and forget about making the usual compensating adjustments for temperature rises and consequent changes in oil viscosity. Your precision is literally under lock and key. Such an achievement has been made possible by several new Heald line features. Heat generating pumps and rotors are isolated from the machine base, pump motors are fan cooled and bridges are cored out to allow heat to dissipate itself. On top of all this heat prevention, any temperature rise which does occur is effectively nullified by the new Heald constant feed hydraulic system of regulating flow of oil. This means your set-up stays "put" where you want it, and, better still, this means completely controlled production in quality and quantity as well.

Ask your nearest Heald representative to give you further details on this time-saving, labor-saving, money-saving feature.

All new Heald Grinders and Bore-Matics include the features which enable you to lock your cycle settings and assume maximum control over precision, production and uniformity.

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American Machinist

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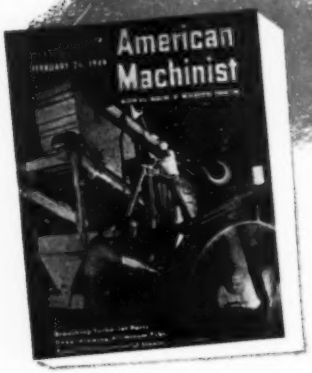


Chips and QUIPS

Our Cover . . . Assembly is epitomized on our current cover, a Kodachrome from the Mountville, Pa., plant of the Wiley Manufacturing Company, a subsidiary of Barium Steel Corporation. At lower right, an arc welder assembles a controllable bottom-dump bucket for concrete, while the shop superintendent uses the bucket for a table upon which to explain details to the fitter at his right. (At Wiley, a "fitter" puts together components of a weldment prior to welding.) In the background, two assemblers work on a mobile rock crushing and screening plant. Robert Yarnall Richie made the shot—one of the best cover compositions we've seen.

Unmachinable . . . Every special-property material seems to be unmachinable at first; we expected the usual experience with the materials for gas turbines and jet engines. First they could be ground only. Then, a few months back, we published the first story on milling Vitallium. Herewith are pointers on broaching various parts, with pictures, from Oliver Bonnafe, chief engineer of LaPointe, who has done much of the special tooling required.

Authors Beware! . . . If you don't like to be considered an authority who is asked for advice from all over Metalworking, don't write for *AMERICAN MACHINIST!* One author tells us he's had sixty letters referring to his recent article, mostly asking if the method he describes could be applied to some other specific problem. Two other authors write in for reprints—so many people have asked for copies and for specific advice that can best be answered by an accompanying copy.

Forming . . . Three articles in this issue discuss various aspects of forming, one covering determination of blank diameters, another the spinning of tube ends, and the third picturing deep-drawing of aluminum tubs . . . These articles continue our extensive series on stamping and forming.

More and Shorter . . . Our 1948 Index, just completed, shows the results of our compression policy—cutting out non-essential detail to conserve your reading time and to allow more articles per issue. In 1948, we published 887 articles, as compared with 730 in 1947 and 579 in 1946—an increase of 53% in just three years. By the same token, the number of authors rose from 388 in 1946 to 409 in 1947 and 446 in 1948.

Counterbores . . . Metal Cutting Tool Institute has had its Research and Technical Committee of the Milling Cutter Division hard at work on the subject of counterbores. . . . Herewith, under the title of "How Counterbores Behave," we present their report on the torque, thrust and power required to counterbore various materials with either carbide-tipped or HSS tools. Here again are vital research data in succinct, easily readable form.

25-Dollar Club . . . Last year's 26 Practical Ideas contests resulted in the mailing of 28 $25 checks to 23 different shop men. Three contributors won twice, and one hit the jackpot three times in 1948. Winners aren't grouped either, because England, Canada, India, Chile and the U.S. all got a share in the extra dividends. There were two ties, in the Sept. 23 and the Oct. 7 issues, and all four contributors received an extra $25 check.

38 Years Ago . . . On a page from our issue of Dec. 22, 1910, is this enlightening ad: "Wanted—First-class machine-tool salesman, with practical experience preferred; must be alive and competent to produce results . . ."

Coming . . . March 10 *A.M.* will feature a Special Report on Forming Light Metals with Rubber, a review of progress. We have a down-to-earth discussion of hard chromium plating by Arthur Logozzo, practical plater and next president of the Electroplaters; an explanation of the behavior of 75ST; practical details on how to grind medium-pitch gears; and a move-by-move description of revamping a machine shop. Then there are several shop shots from I.T.E. Circuit Breaker.

STEEL TESTER . . . Elbert C. Kirkham is an identical twin, born to the owner and publisher of a farm magazine and newspaper. He went to country school, then to high school in Salt Lake City and the University of Utah. He managed a W. T. Grant store, then the drapery and piece-goods department for a local Sears Roebuck—which got him into a night-school course on identifying fabrics.

During the war, as storekeeper for Remington Arms, Mr. Kirkham went back to night school for metallurgy, machine design, wet assaying and heat-treatment—to identify steels. As metallurgist for the U. S. Engineers, he set up a lab. and made his first test kit. Now, as curator, College of Mines & Mineral Industries and Utah Engrg. Exp. Station, University of Utah, he makes kits for students, has developed new procedures described in this issue for testing anything from a machine part to an arc-furnace charge.

For Producing
SMALL BEVEL GEARS

Whether you need small spiral bevel, Zerol bevel, hypoid gears or Curvic clutches, the new Gleason No. 2 Hypoid Generator is capable of producing it. This versatile generator, rigidly constructed and featuring closer control of actual cutting, faster speeds and a superior tooth bearing is the last word in equipment for the manfacture of small bevel gears.

GLEASON No. 7
Hypoid Cutter Sharpeners

① As a necessary supplement to the cutting machinery the Gleason No. 7 Hypoid Cutter Sharpener provides a simple, economical means for sharpening the multi-blade circular cutters used in the No. 2 Hypoid Generator. This machine is a wet-type sharpener capable of producing a high quality cutting edge and finish on the cutters, thus providing a smooth surface finish in the cut gears.

GLEASON No. 4
Angular Bevel Tester

② The Gleason No. 4 Anguar Bevel Tester can be used to either hand roll or power test bevel gears cut on this machine. Rolling qualities, tooth spacing and concentricity are checked on this machine.

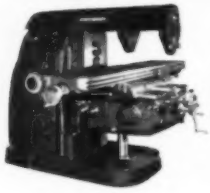
GLEASON *Works*
1000 University Avenue
Rochester 3, N. Y., U. S. A.

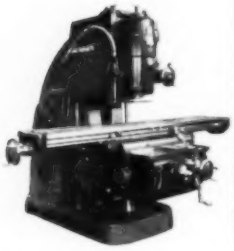
Builders of Bevel Gear Machinery for Over Eighty Years

Click, Click, Click ... and there's the Speed and Feed you want

POWER SELECTED WITH ONE LEVER

It's almost as easy to do as to talk about it. That's why operators really like the High Power and Dual Power Dial Types. They're big, rugged, take heavy cuts (up to 50 hp for the largest sizes), yet they're exceptionally convenient and easy to run. This one Cincinnati feature of power speed and feed selection, at the *front and rear working stations*, goes a long way toward reducing milling costs. Efficient cutting becomes a habit with the Dial Type operator because it's so easy to select the right combination of speeds and feeds. There are other features, too, of interest to both shopmen and management. You will find them outlined in two attractive catalogs: Nos. 3, 4, 5 and 6 High Power Dial Types, M-1644. Nos. 3, 4, 5 and 6 Dual Power Dial Types, M-1647.





High Power and Dual Power Dial Type Milling Machines have labor-aiding power speed and feed change. Built in Nos. 3, 4, 5 and 6 sizes; plain and vertical styles; Nos. 3, 4 and 5 in universal style. Catalog M-1644 for High Power Dial Types; M-1647 for Dual Power Dial Types.

Left: The speed dial can be rotated in either direction. It is equipped with a built-in milling speed calculator for determining the correct cutting speed and cutter rpm.

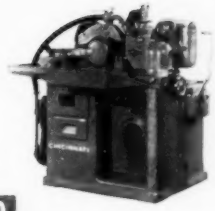
Right: The feed dial can be rotated in either direction. Shown with its cover removed, the feed dial is provided with two sets of figures, one visible when working at the front of the machine, the other visible when working at the rear.

Single lever at the front working position for selecting speeds and feeds throughout their complete range of 100 to 1 and 240 to 1 respectively. Note "INCREASE" and "DECREASE" positions for rotating the speed and feed dials in either direction. This feature invites maximum cutting efficiency.

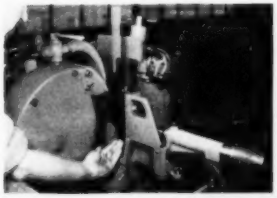
THE CINCINNATI MILLING MACHINE CO.

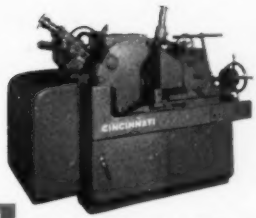
CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

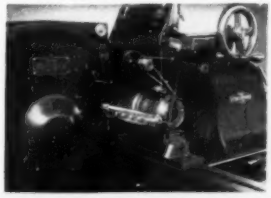


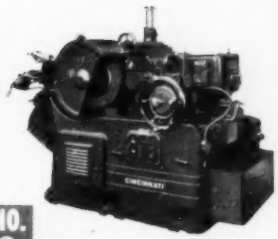
NO. 0 CINCINNATI FILMATIC No. 0 Centerless Grinding Machine, above. Catalog G-576-1. The No. 0 below has been tooled up with a magazine fixture to grind small drills, five of which are in the operator's hand.



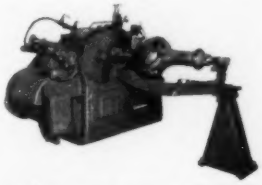


NO. 2 CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Catalog G-574. The most popular of all CINCINNATI Centerless Grinders, these machines are employed in grinding operations on various metal parts, wood, rubber, glass, plastic. The machine below has been tooled up to grind taper end of glass condenser tubes and other glass parts.





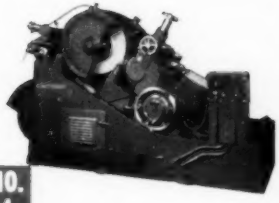
NO. 3 A CINCINNATI FILMATIC No. 3 Centerless Grinder is illustrated above. Catalog G-570-1. The illustration below shows one of these machines equipped with an outboard roller support to grind two diameters at each end of truck axle housings.



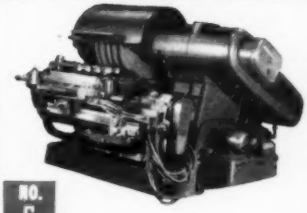
CINCINNATI

There's a Cincinnati FILMATIC Centerless

For your kind of work!



NO. 4 CINCINNATI FILMATIC No. 4 Centerless Grinding Machine. Catalog G-538-1. Below, a No. 4 is grinding aircraft cylinder barrels. Angular construction of the bed aids work rotation.



NO. 5 6 The machine above is a CINCINNATI FILMATIC No. 5 Centerless Grinder. Specifications on request. The No. 5 below, equipped with a return conveyer, is grinding pistons. No. 6 Centerless takes up to 75 hp.

● One user grinds surgical sutures, another grinds balance staffs for watches and clocks, and still another grinds steel bars—finished warehouse stock—on CINCINNATI FILMATIC Centerless Grinding Machines. Whatever your requirements may be, or the size of work, or the material from which it is made, Cincinnati can supply the correct centerless grinding machine. They are available in six sizes: Nos. 0, 2, 3, 4, 5 and 6. All of them have FILMATIC Grinding Wheel Spindle Bearings, an outstanding favorite with grinding men everywhere. And a wide selection of accessories and equipment is available for standard machines . . . FEEDMATIC Hoppers for automatic and continuous feeding; profile and radius wheel truing equipment; four types of bar grinding equipment, and many other fixtures. ¶The Cincinnati centerless method of rapid precision grinding offers many cost cutting advantages. Our Application Engineers will be glad to explain further. Meanwhile, write for the literature mentioned here.

CINCINNATI GRINDERS INCORPORATED

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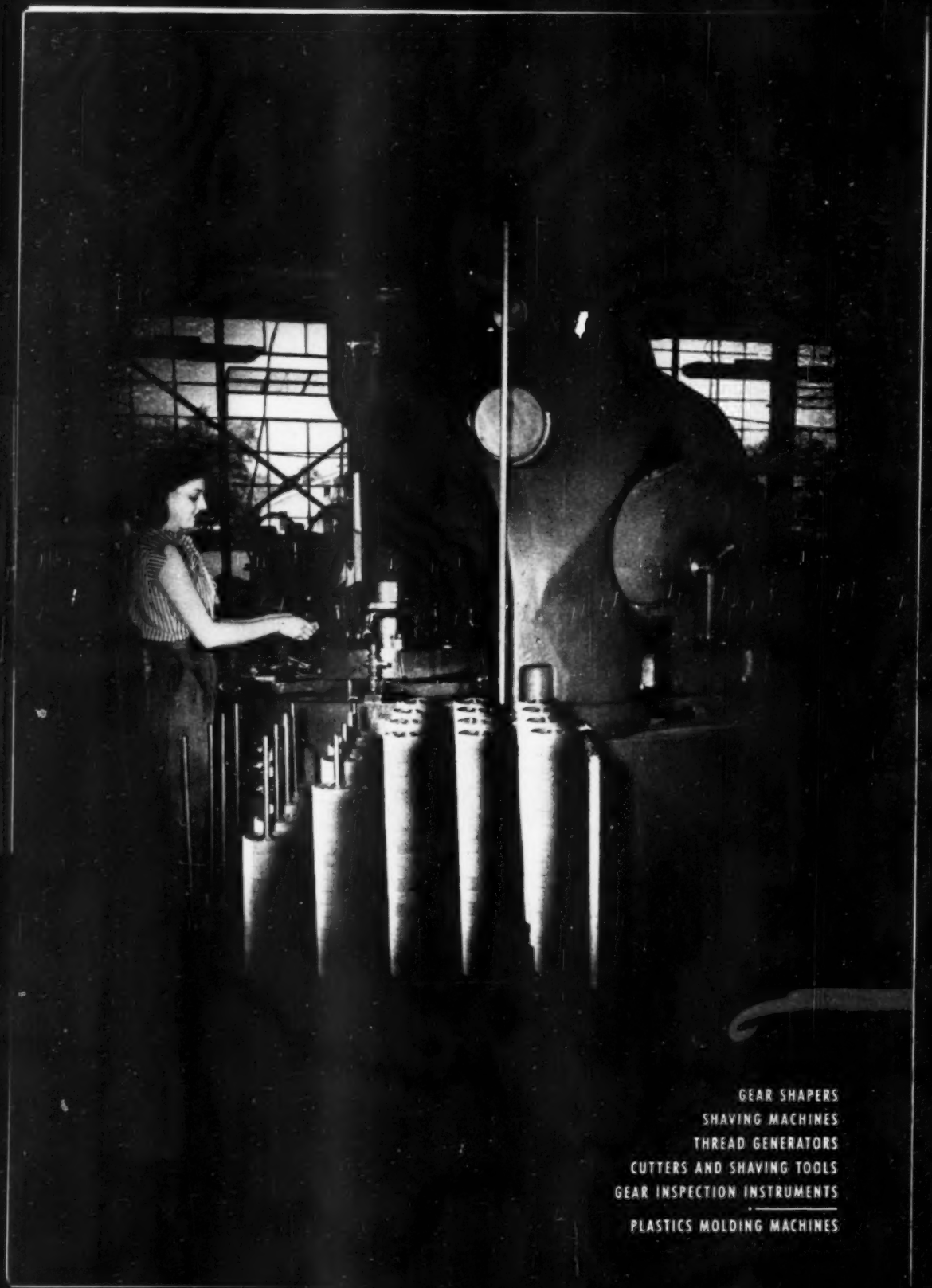
CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

THE PLANETARY

for pace setting production

On Washing Machine gears, as shown opposite, or on intermediate-size Transmission Pinions and such, the record speaks for itself.

	Washing Machine Gear	Idler Gear	Transmission Gear
Material	C.I.	S.A.E. .5150	Forged Steel
Pitch diameter	3.8125"	1.900"	3.200"
No. of teeth	60	19	24
Diametral Pitch	16	10/12	7.5
Pressure Angle	20°	20°	20°
Face Width	1.250"	.750"	.687"
Spur or Helical	15° Hel.	Spur	Spur
PRODUCTION TIME!	50 per hour!	120 per hour!	128 per hour!

This, the simplest of the multiple-spindle Gear Shapers has first call on your interest if gear costs are a problem. Here you have a machine of massive power, of exceedingly high production capacity — turning out work of typical Gear Shaper quality. The economy of centralizing the handling of blanks and finished parts is another plus advantage.

The Planetary is built with 6 work-holding stations mounted in a turret which planets the work around a 16-inch diameter heavy-duty cutter. A specialist from the Fellows office nearest you will be glad to discuss your specific problems. Literature on request.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
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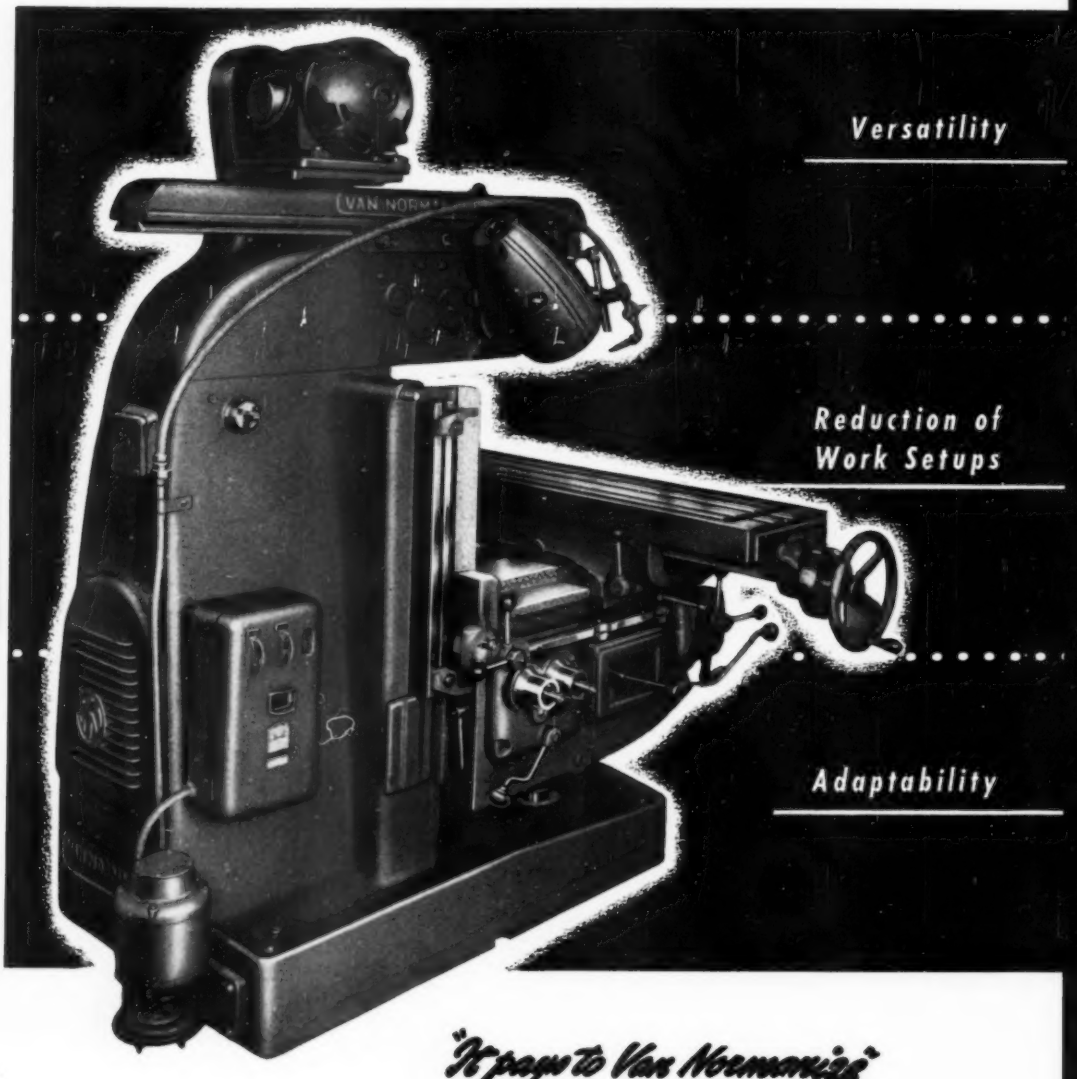
For WORKABILITY

It's VAN NORMAN No. 36 Ram Type Miller

• Saves Setups • Cuts Idle Machine Time

• Increases Production



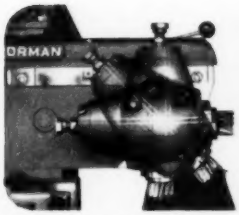
"It pays to Van Normanize"

The versatility of the Van Norman ram-type milling machine provides a greater work range than available on single purpose machines.

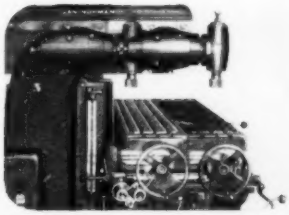
The adjustable cutterhead in combination with the movable ram enables you to perform conventional horizontal and vertical as well as angular milling. This feature cuts setup time by as much as 50% . . . increases productivity proportionately. In addition, front and rear directional controls of power feeds simplify operations . . . cut operator fatigue.

The Van Norman No. 36 Miller is ideal for use in the tool room, job shop, pattern shop, experimental laboratory, die and mold shop and for production work.

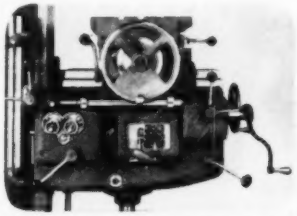
Write for illustrated bulletin, today.



Adjustable cutterhead permits vertical, horizontal or angular milling on one miller. Its versatility is equal to three single-purpose machines.

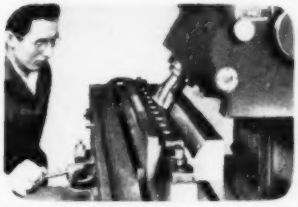


Adjustable cutterhead and movable ram in combination with the saddle crossfeed provide maximum milling capacity and versatility.



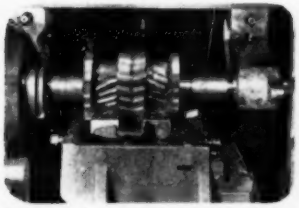
Front and rear directional control of hand and power feeds give complete visibility and control of operations from either location. Reduces worker fatigue . . . improves work accuracy.

Horizontal milling—with cutterhead locked in horizontal position, operator uses rear directional controls and starts with a face milling operation.



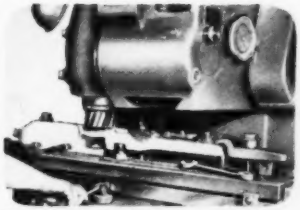
Angular milling—Here a V is being milled. Note that only the position of the cutterhead has been changed; workpiece is still in original position.

Vertical milling—Operator completes job with recess milling operation, using front directional controls. One work setup with simple cutterhead position changes completes most jobs.



Horizontal setup for boring and facing operation. The ram-type overarm with dovetail ways and outer support assures rigidity and accuracy.

With head locked in angular position the operator is taking an angular cut and operates the miller with the rear directional controls.



The ram-type miller used with adjustable cutterhead in the vertical milling position . . . operator using front directional controls.

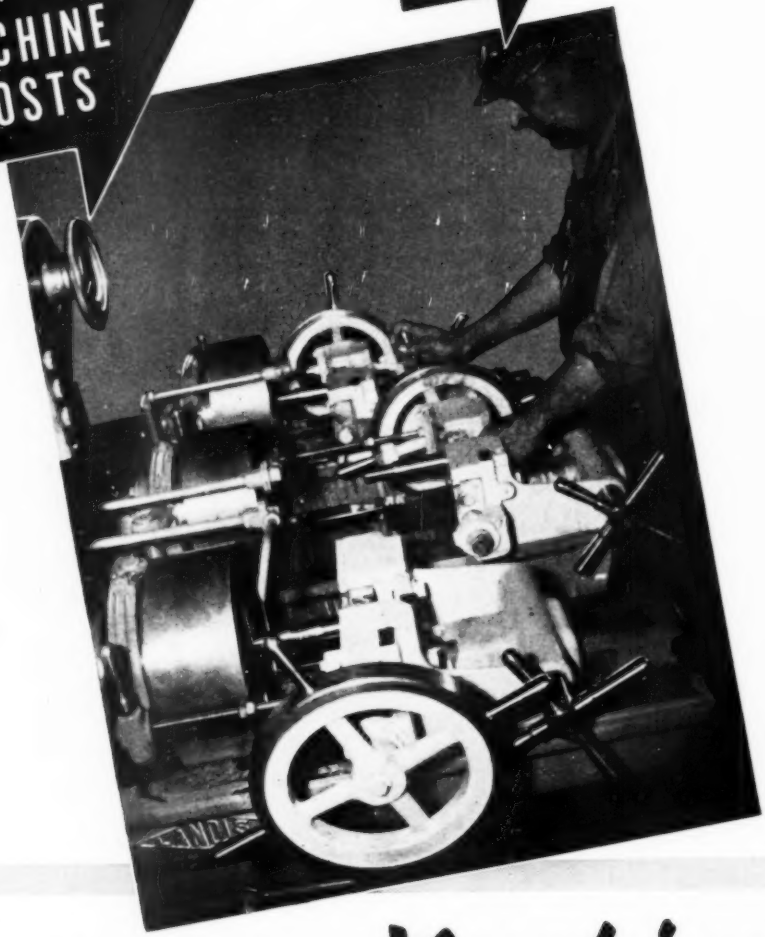
VAN NORMAN COMPANY

Springfield 7 ***Massachusetts***

Railroad Cuts Standby

SAVINGS IN MACHINE COSTS

SAVINGS IN LABOR

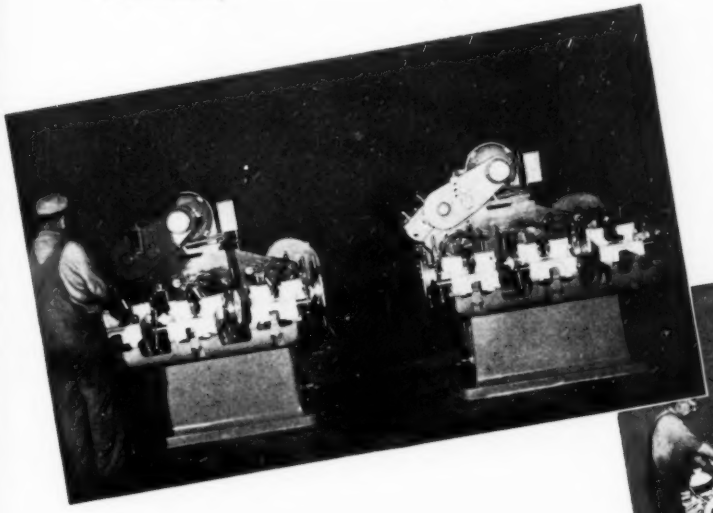


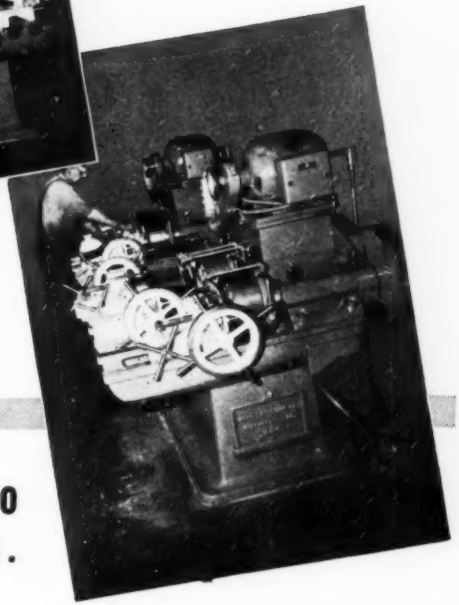
The LANDIS Machine

Maintenance Costs . . .

Large savings in capital invested in heavy machinery and hourly labor costs have been effected in the maintenance shops of the Chicago, Burlington, and Quincy Railroad. In the past, four machines, each with an operator, were used exclusively for threading 1¼" steam engine bolts. Recently two Landis 1½" Triple Head Threading Machines were installed in these shops. These Landis Machines now do the work previously done by the four machines of another type. Two men now operate these machines where four men were previously required. Such savings are one reason for the widespread use of Landis Threading Equipment in railroad shops throughout the country.

For further information and specifications, write for Bulletin B-55.





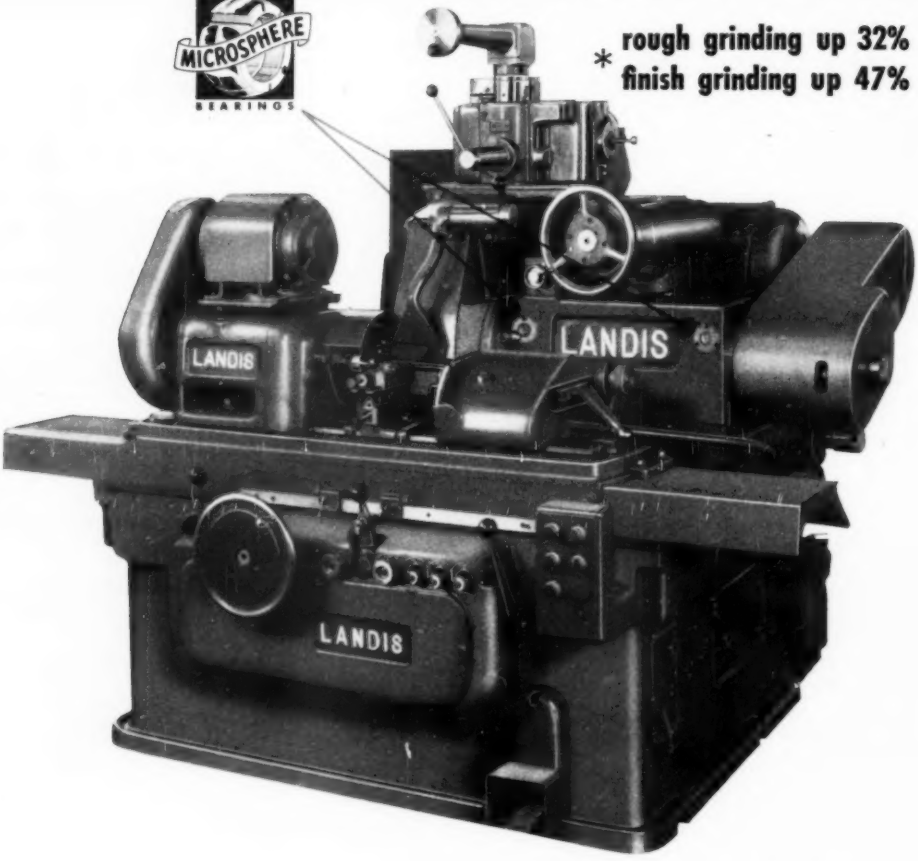
CO. WAYNESBORO PENNA. U.S.A.

how a modern LANDIS TOOL grinder

REDUCED COSTS

EQUIPPED WITH MICROSPHERE BEARINGS

* rough grinding up 32%
finish grinding up 47%

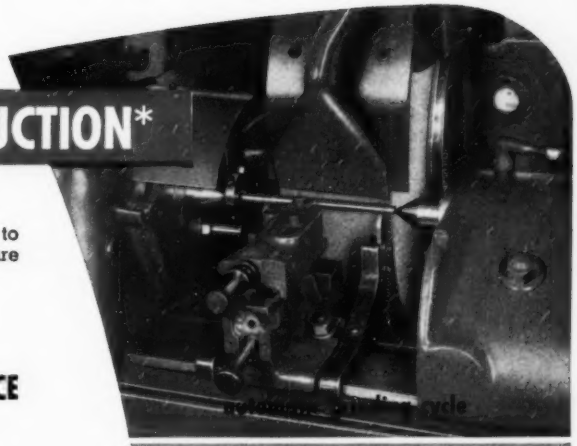


LANDIS TOOL 10" x 18" Type CH Plain Hydraulic Cylindrical Grinder With Special Tooling.

LANDIS TOOL
Precision Grinders

LANDIS TOOL Engineered Grinding Service will help you with your grinding problems. Production estimates and recommendations will be made on the basis of your blueprints.

INCREASED PRODUCTION*



An electric motor manufacturer wanted to increase production of motor armature shafts and reduce grinding costs.

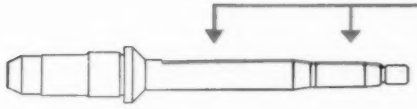
LANDIS TOOL

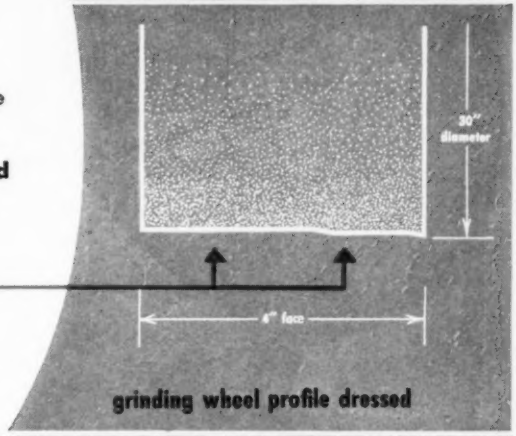
ENGINEERED GRINDING SERVICE SOLVED THE PROBLEM

by a standard cylindrical grinder tooled for semi-automatic profile grinding.

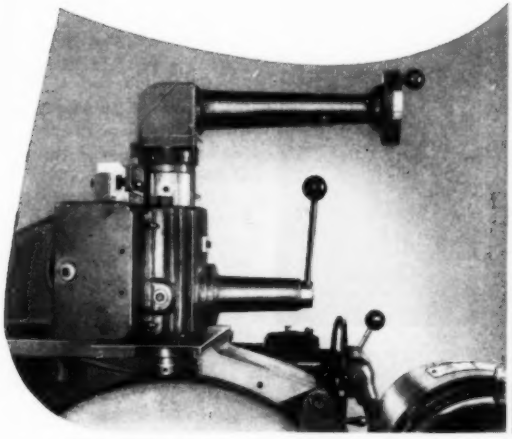
Three tapers and one diameter ground at one time by infeed grinding.

production	rough grind	finish grind
Stock Removal	.012"	.008"
Production per hour	140	162

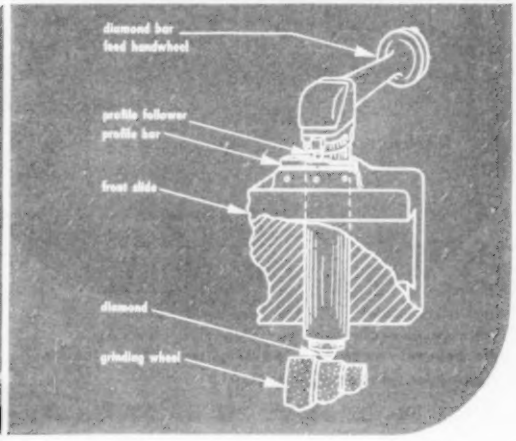




grinding wheel profile dressed

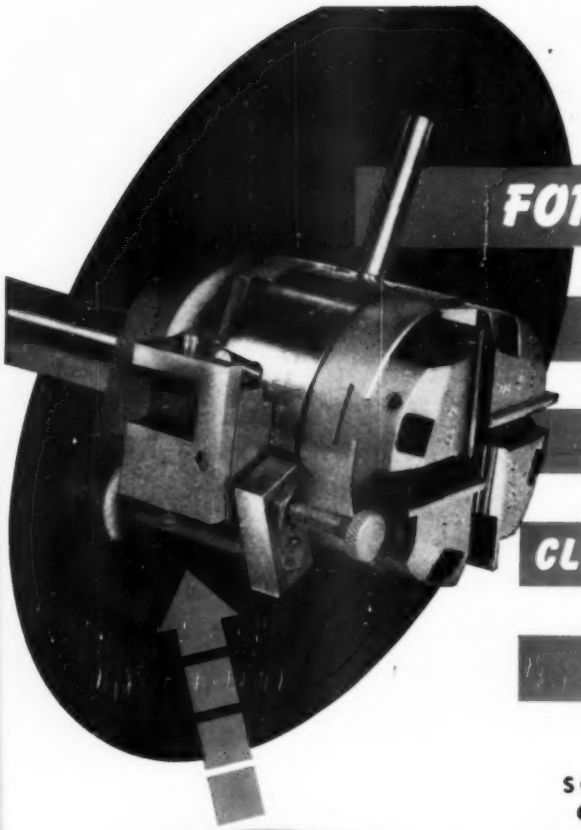


hydraulic wheel dresser *Fender mounted hydraulic dresser cuts dressing time Gives choice of profile or straight dressing.*



profile dressing *Profile bar insures accurate and rapid step dressing of wheel. Other profiles can be dressed by changing the profile bar.*

LANDIS TOOL COMPANY • WAYNESBORO, PA.



FOR SOFT STOCK

FINE PITCH

SHORT LENGTH

CLOSE-TO-SHOULDER

THREADING

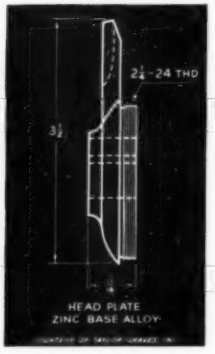
External Trip Attachment

FOR ALL JONES & LAMSON STATIONARY TANGENT DIE HEADS.

Provides low cost threading in BRASS, ALUMINUM, ZINC, PLASTICS and other soft materials. Cuts as little as one *full turn of quality thread, with automatic release!*

We believe we can help you. Why not call or write us about your threading problems?

SCRATCH JOBS LIKE THIS OFF THE TROUBLE LIST!



Fine pitch threading in cast zinc alloy . . .
Material too soft to stand pull-off pressure of ordinary die . . .
Overtravel dangerous due to close shoulder and projecting lug . . .
Quite a problem!

Yet a Jones & Lamson Tangent Die, equipped with an EXTERNAL TRIP ATTACHMENT, takes this job in stride. *It trips without pulling against the threads*—no danger of stripping or side trimming. Precise stop control eliminates all risk to work, die or chasers.

Thread Tool Division

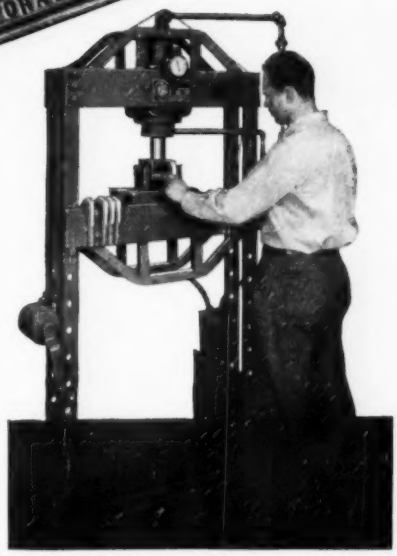
J&L JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

"ARBOR PRESS" IN NAME ONLY!

FRONTIER BRONZE CORPORATION SPEEDS MANUFACTURE OF NEW ALUMINUM PIPE WRENCH WITH KRW MOTOR-DRIVEN ARBOR PRESS

SEE HOW A LITTLE INGENUITY SAVES A LOT OF MONEY! A special coining die used in this standard KRW 50-ton motor-driven arbor press removes burrs which result from normal manufacturing procedure. A simple operation which eliminates the need of costly grinding and assures a free-running, tight fitting, adjusting nut. *This new wrench weighs 60% less than conventional types yet withstands the same tests.*



THE CONVENTIONAL ARBOR PRESS has come a long way in the past few years. From such every day tasks as straightening and bending, it has grown into a full size production tool. Today — because of their low initial and operating cost — you'll find KRW Arbor Presses doing hundreds of manufacturing operations in all sorts of plants. A little ingenuity, combined with simple, inexpensive dies can save you money by releasing heavier, more expensive equipment for larger work.

KRW Hydraulic Arbor Presses are available in varying sizes and tonnages, either hand-operated, air-operated or motor-driven. Tell us your needs . . . we are fully equipped to advise and engineer presses to do your particular job. Deliveries on standard presses within 10 days.

NEW KRW 100-Ton Blanking, Forming, Stamping Press

Batteries of these New KRW Presses are now in use in many manufacturing plants doing all manner of work hitherto handled on presses whose installation costs are higher than the total cost of these revolutionary KRW Presses. Write for literature.

VERSATILE · ADAPTABLE · LOW COST!

● KRW Arbor Presses can be furnished for either vertical or horizontal ram travel. Distance between uprights can vary from 1 foot to 7 or better, daylight from inches to 6 feet and more. Even these specifications can be increased with minor changes and little cost. Investigate, use the coupon.

NAME YOUR NEEDS! MAIL COUPON TODAY!

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

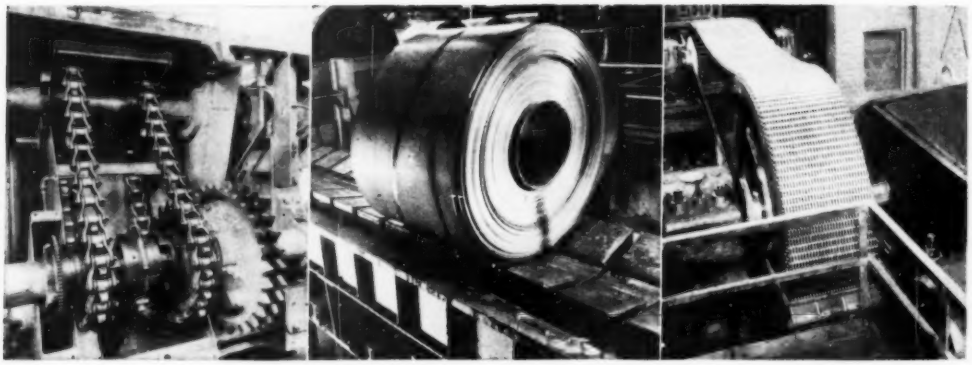
Please send me complete information on KRW Arbor Presses ☐
100-ton Hydraulic Presses ☐

Name.....

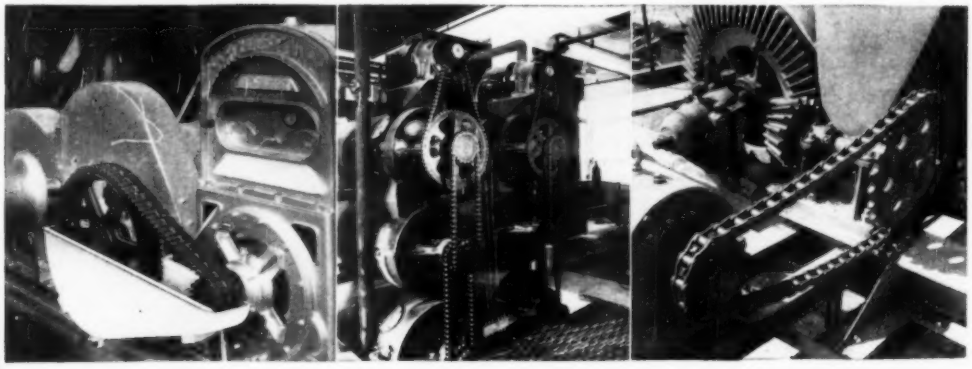
Address.....

City and Zone..... State.....

. . for Chain advice, based upon longest experience



. . for Chain advice, backed by the finest facilities,



. . we invite you to consult Link-Belt Engineers . .

You are invited to draw upon the most extensive and intensive experience in the application and production of chains for drives, conveyors or elevators. Your problem is very likely well within the broad Link-Belt experience, and a discussion with a Link-Belt engineer may very well produce a speedy and proper solution.
You are invited to consult Link-Belt without obligation.

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11.331-A

. . Chain--by LINK-BELT

for Drives and Conveyors

NOT A SINGLE CAM CHANGE NEEDED

To Make All of These Parts

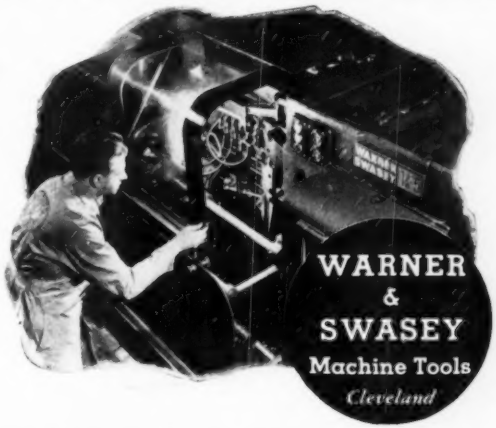
ON A WARNER & SWASEY 5-SPINDLE AUTOMATIC

★ Nearly 300 different parts are produced on a Warner & Swasey 5-Spindle Automatic at Electric Controller & Mfg. Co., Cleveland.

★ *Not a single cam change* is required to produce this variety of jobs.

★ Patented "Quick Set" mechanism eliminates all expense of designing, machining, storing and finding cams, and time-taking setup.

Call your Warner & Swasey field representative.



You can machine it better, faster, for less...with a Warner & Swasey

TURRET LATHES, MULTIPLE AND SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

More about the cost-saving features

Pre-set Truing and Grinding Speeds – maintain separate table speeds for truing and for grinding—immediate selection by this lever.

Work Jogging with this fingertip lever, work may be jogged at any time – whether work rotation is being automatically or manually governed.

Electrical equipment servicing made easy. Major controls located in elevated, accessible cabinet. Note rigid conduit.

Hinged guard for rapid wheel change – **ramped outlet** to coolant tank for easy sludge removal.

Pumps and motors mounted outside base to insure convenience and minimum time consumption in maintenance and service.

Steel ribbon type guards provide complete protection of base ways and require no extra floor space.

Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Mediums · Non-slip Floors · Norbide Products · Labeling Machines

of the NORTON TYPE CTU CYLINDRICAL GRINDERS

NORTON grinding machines are designed not only for precision and dependability—they're designed with cost-cutting operating and maintenance features! For instance, the new Type CTU machines provide:

For reduction of operating costs:

1. "Lever-flip" pre-set Truing and Grinding Speed Control
2. "Finger-tip" Work Jogging Control
3. "Click-Count" rapid Wheel Feed Index
4. "Micro-fine" Wheel Feed
5. "Silky-smooth" Hand Table Traverse

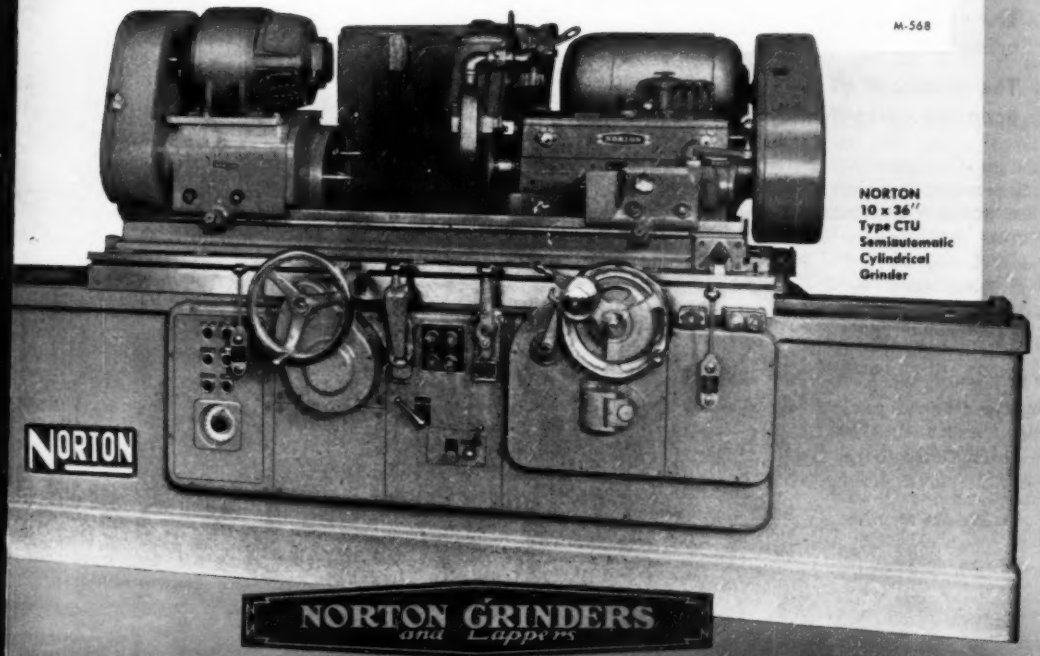
For reduction of maintenance costs:

1. "Stand-up" servicing of major electrical controls
2. "Elbow-level" Wheel change
3. "Quick-clean" Coolant Tank design
4. "Knee-high" Hydraulic and Coolant Pump mounting
5. "Space-saving" steel Ribbon-type Baseway Guards

Such features mean real savings. They reduce the need for high operating skill—lessen effort—speed production—and greatly reduce "down time" for maintenance.

Write for catalogs—no obligation of course.

M-568



NORTON 10 x 36" Type CTU Semiautomatic Cylindrical Grinder

NORTON GRINDERS and Lappers

NORTON COMPANY, WORCESTER 6, MASS · New York · Chicago · Detroit · Cleveland · Hartford · Distributors in All Principal Cities

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

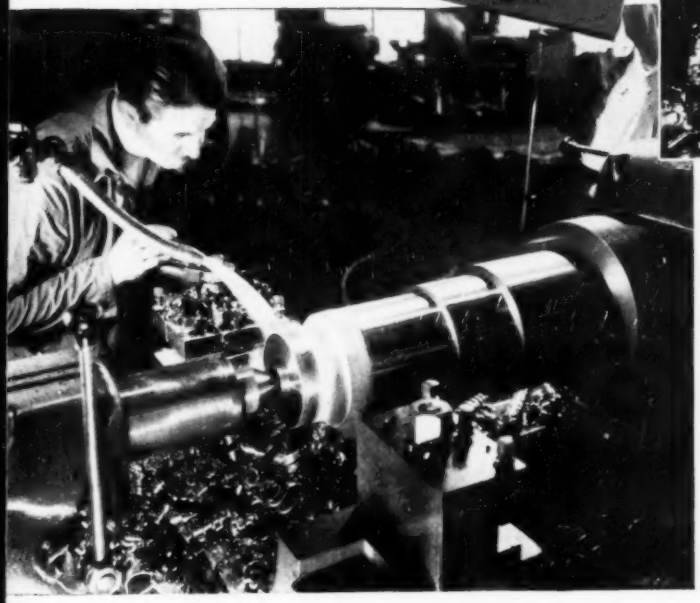
"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for New S-48 Catalog just released.

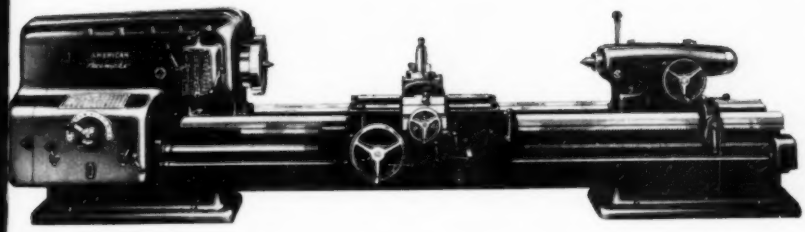
40 H.P. CUT
on Main Pin Forgings



The new 25-inch "AMERICAN" Pacemaker Lathe powered with a 40 horse power driving motor is here shown machining Locomotive Main Pins from rough forgings. The cut being taken consumes 40 horse power and the time for the job is 30 minutes, floor to floor.

This is just a sample of what this new lathe will do. It is tremendously powerful and rugged and yet its ease of operation is amazing—finger tip control best describes it. It has speeds for both high speed steel and cemented carbide tools, a wide range of threads and feeds and a massive bed designed for chip disposal at the rear.

For machining axles this new lathe equipped with "AMERICAN" Hydraulic Duplicator is the latest contribution to lower axle costs.



Send for descriptive Bulletin No. 23-A.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

UNBRAKO

REG. U.S. PAT. OFF.

Pat. & Pats. Pending

SELF-LOCKING
KNURLED
CUP POINT

... proved by

EXPLANATION OF VIBRATION TESTS DEMONSTRATING THE HOLDING POWERS OF DIFFERENT TYPES OF "UNBRAKO" SOCKET SET SCREWS

Better than words, the graph of actual vibration tests quickly tells the story of the exceptional "HOLDING POWER" of the "Unbrako" Self-Locking Set Screw with the Knurled Cup Point . . . *"the screw that won't shake loose."*

Vertically, the graph is divided into increments of 30 minutes. Each bar—black for Plain Cup Point and red for Knurled Cup Point—represents a screw tested and the number of minutes at which it loosened. *The height of each black bar, therefore, is a direct measure of the length of time before the plain pointed screw shook loose.* The Self-Locking Knurled Cup Pointed Screws—indicated by the red bars—were still tight at 300 minutes.

All screws were tested under identical conditions. Rate of vibration—1750 cycles per minute . . . duration of test—until screw shook loose or tests were discontinued.

Analyzing the graph and comparing the two types of screws, we find that the most favorable test of the Plain Cup Point shows a failure at 10 minutes and 40 seconds. *No Knurled Cup Point shows signs of loosening at 300 minutes—more than 28 times the "HOLDING POWER" of the Plain Cup Point—a tremendous superiority . . . as proven by actual tests and use.*

The "Unbrako" Self-Locking Set Screws with the Knurled Cup Point can be used over and over again.

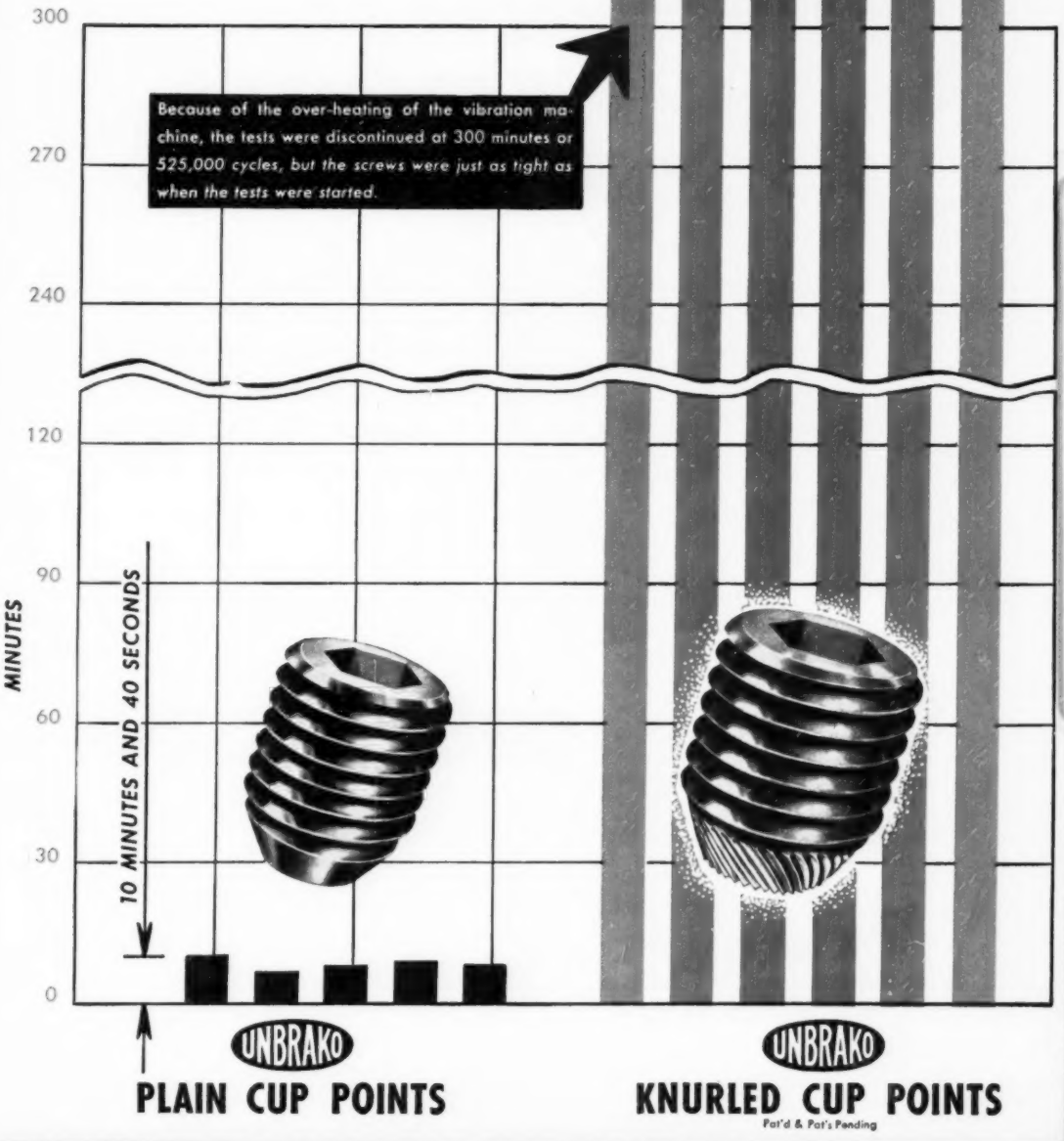
OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

BOX 4, JENKINTOWN, PENNSYLVANIA

BRANCHES: CHICAGO DETROIT ST. LOUIS SAN FRANCISCO

actual tests



locate
work
check
TO TENTHS
ON THE P&W
JIG BORER

The original jig borer was conceived and built by Pratt & Whitney about 30 years ago. It was a revolutionary development, and changed the whole toolroom concept of precision boring. Pratt & Whitney has been building jig borers ever since . . . with many *tested* improvements in convenience, speed and durability. The P&W Jig Borer is the most accurate of today's machine tools . . . will retain its initial accuracy through a long useful life . . . does the fast precision boring modern tool shop work demands . . . is an essential toolroom machine . . . first choice of experienced tool engineers.

P&W Jig Borers use the time-proved P&W spacing method . . . basic measuring instruments . . . end measures for even inches, inside micrometers for subdividing an inch, plus dial indicators for measuring pressure control and visible safeguard against errors.

GET THE PRECISION HOLE STORY, TOLD IN JIG TIME, IN THIS NEW BOOK

. . . It tells you the "why" of the Jig Borer as a money making toolroom and manufacturing machine; the "why" of its operating precision and convenience and of its incomparable measuring system; its fundamental precision and the "how" of putting that precision to profitable work.

Worth reading! . . . Worth keeping!

CLIP THIS COUPON FOR YOUR FREE COPY

Pratt & Whitney
Division of Niles-Bement-Pond Company
11 Charter Oak Boulevard
West Hartford 1, Connecticut

Gentlemen:

Please send me, without obligation my copy of the new P&W Jig Borer Book.

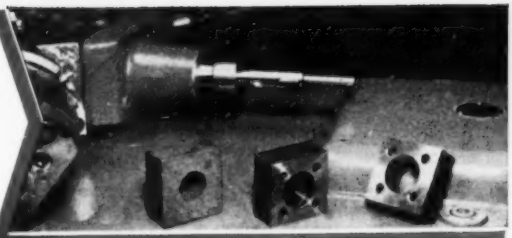
Name.....
Title.....
Company.....
Address.....
City.....State.....

Pratt & Whitney
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

JIG BORERS

Do it QUICK:

14 machining operations* in 1.49 minutes on this aluminum bronze cam block blank.



Do it ACCURATELY:

On this job, boring, facing, drilling and reaming are accomplished not only at maximum speed but with the exactness specified on the blue print.

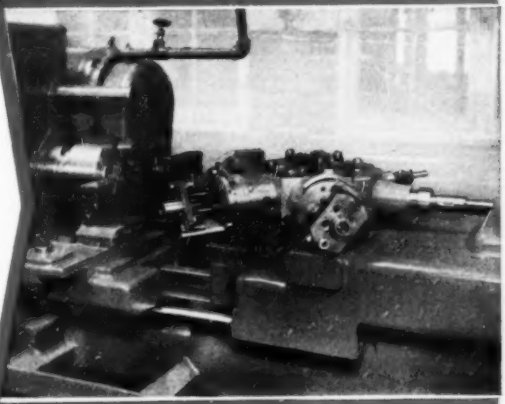
Do it ALL:

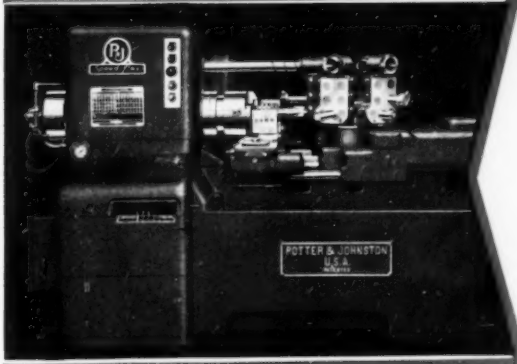
Here's the tooling. *One* setting does the trick. The recessed side of the blank is presented to the spindle and gripped on O. D. with 3 chuck jaws. Then:

1st T. F. — Rough bore hole
Rough face, one side
2nd T. F. — Finish bore hole
Chamfer hole
Finish face, one side
3rd T. F. — Ream hole, 1¼" dia.
4th T. F. — Drill four 19/64" dia. holes on 2" B.C.
5th T. F. — Ream four 5/16" dia. holes on 2" B.C.

*Adds up to 14 operations

Note that even the *drilling* is done on the P&J Turret Lathe — a tremendous time and trouble saver.





Do it on the P&J 3U SPEED-FLEX

— the last word in Automatic Turret Lathes for low cost, quantity production of parts up to 6" dia; equipped with four automatic changes of speed and three automatic feed changes, electro-pneumatically controlled; split second shift from rapid traverse to reverse feed; independent or simultaneous cross-slide operation with selected turret faces or with all six.

Are You Willing to be Shown?

—Potter & Johnston tooling experts will gladly work out tooling and time estimates for *your* small parts production problems. Simply send us parts or prints.

Potter & Johnston Company

Pawtucket, R. I.
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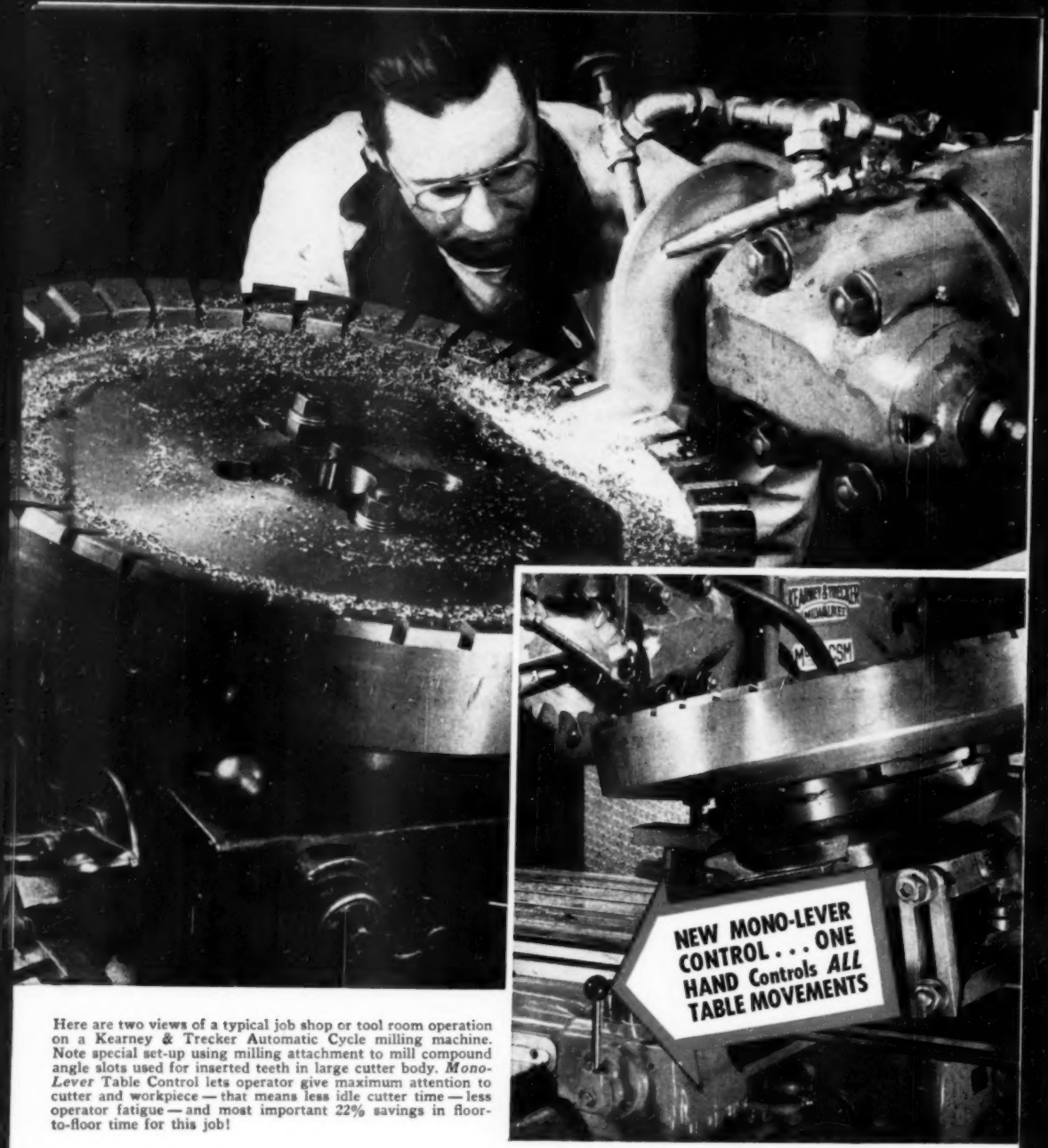
P&J

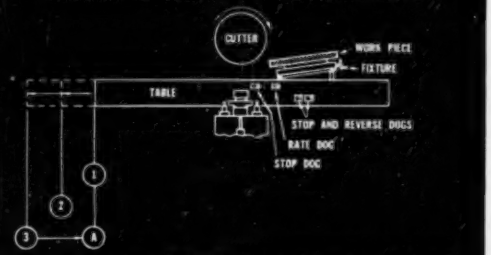


Here are two views of a typical job shop or tool room operation on a Kearney & Trecker Automatic Cycle milling machine. Note special set-up using milling attachment to mill compound angle slots used for inserted teeth in large cutter body. *Mono-Lever* Table Control lets operator give maximum attention to cutter and workpiece — that means less idle cutter time — less operator fatigue — and most important 22% savings in floor-to-floor time for this job!

In face of rising costs . . CAN YOU CYCLE TIME SAVINGS

HOW JOB IS DONE

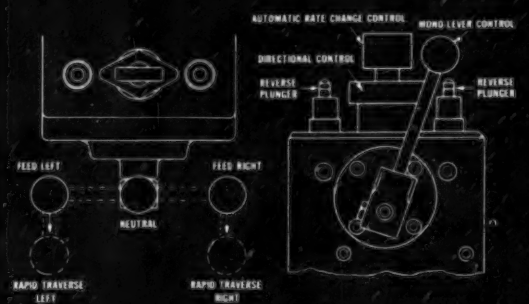
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL



1. Operator engages Mono-Lever. Table advances in rapid traverse to point of cut (2).
2. Feed dog changes rapid traverse to feed for cut. Table feeds through cut to (3).
3. Stop and reverse dogs reverse table in rapid traverse back to starting point (A) to stop. Operator indexes workpiece and repeats cycle.

HOW IT WORKS

AUTOMATIC TABLE CYCLE and MONO-LEVER CONTROL UNIT



YOU'RE LOOKING at a diagram of the job at the left. See how *Mono-Lever* Control and Automatic Table Cycling make it easy for the operator . . . speed up production. No wonder users report 16 to 31% savings in cycle time alone.

THINK OF IT! Now you can have all the advantages of this great cost-cutting feature plus the all-around versatility of general purpose, knee-type machines . . . faster, easier control for greater production with less operator fatigue.

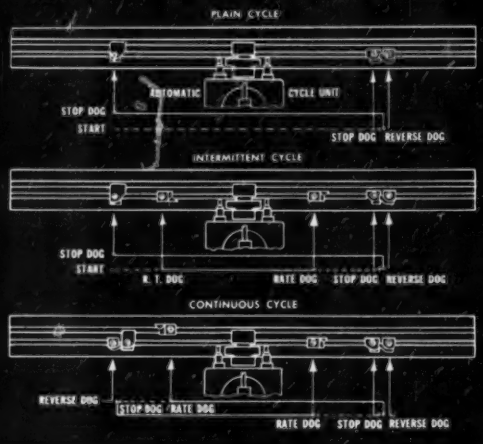
YES! Kearney & Trecker's constant research and development program — always directed at getting greater production at lower costs — has found what you have been looking for.

They're new knee type milling machines that combine mass unit production and versatility for general purpose and job shop work. Kearney & Trecker Milwaukee knee-type milling machines equipped with Automatic Table Cycle and *Mono-Lever* control *do just that*. They offer you *right now* the opportunity to mill *more units* with *more profit* in *less time*.

Of equal importance to you is the opportunity for proper machine selection. You neither *over-buy* nor *under-buy*, but you buy *right* when you choose from the *56* machines in this new Kearney & Trecker line.

For some startling facts about these machines and their application to your milling work, consult a Kearney & Trecker Sales Representative today. He's been schooled in the "know-how" and he's at your service. For detailed information, contact him or write us direct. Ask for catalog No. AC-10A. Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

TYPICAL CYCLES YOU CAN USE



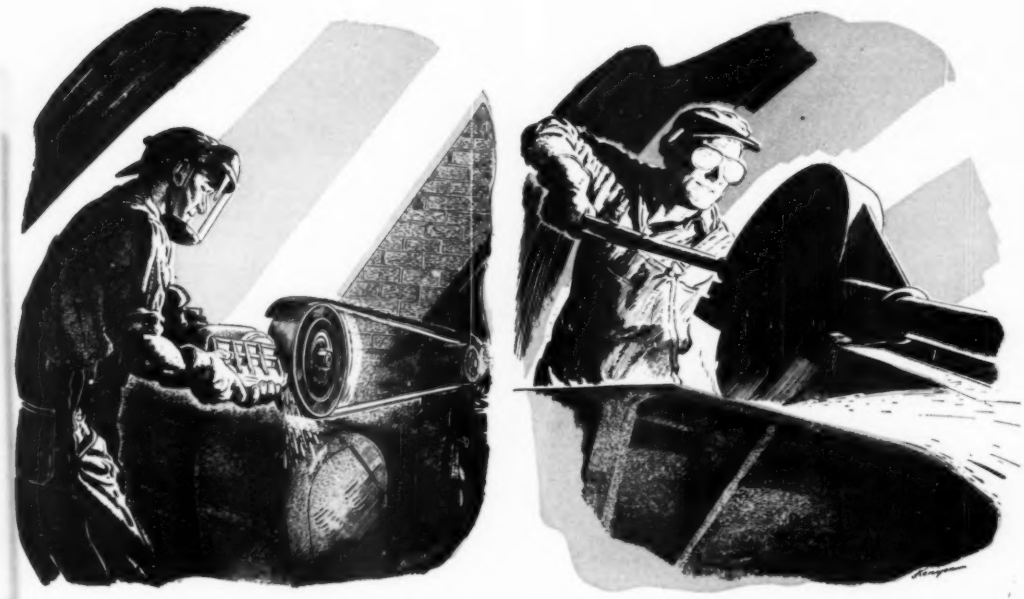
THREE DIFFERENT TYPICAL CYCLES to accommodate various length of runs. Using the completely automatic cycle feature effects savings of up to 31% for lots of 10 or more pieces. Cycle can be pre-set to meet operators required loading and unloading time and can be reversed in feed or rapid traverse.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

AFFORD TO PASS UP UP TO 31% OR MORE?

A note on Abrasives

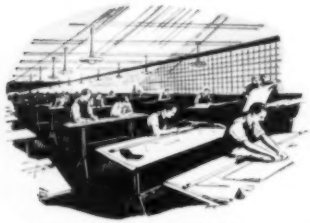
Better utilization is leading to higher productivity...lower cost



New developments in abrasive uses are being introduced continually. They are offering new production efficiencies and often provide the solution to difficult and complicated problems.

The degree to which these benefits and improvements are realized depends upon obtaining the full value offered by these products. It means utilizing them to best advantage. The best product available will not deliver top performance under unsuitable conditions. A slight change in grit or splice—or in grade, shape, or speed can often reduce a cost or improve a finish. That is why it is so important to "fit" the abrasive products you use to the job. In the experience of many abrasive users, it is a time and money-saving must.

If you would like to know whether you can use a better abrasive product or get more production or economy from the abrasive tools you are now using, it's a simple matter to call in CARBORUNDUM. We invite you to get acquainted with our service where similar problems are being worked out every day. Abrasive engineering, technical cooperative assistance, and the vast facilities and experience of the leading name in abrasives are always ready to serve you. The Carborundum Company, Niagara Falls, N. Y.



The only complete line of Abrasive Tools is

CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

Engineering News
ON ABRASIVE PRODUCTS

Greater Efficiency from New Coated Abrasives

A much higher degree of efficiency is being realized in dry grinding operations on metals. It is credited to the development of a new Resin Industrial Cloth specially designed for use on backstand idlers. This product is particularly effective on operations involving heavy stock removal, sharp contours, high belt speeds, heat sensitive metals, excessive frictional heat, humidity and other complications.

Strength, heat-resistance and backing characteristics provide longer productive life where severe strains are imposed. A remarkable freedom from gumming and loading, together with resistance to grain shedding, produce fine finishes, results in infrequent belt changes. This means stepped up production . . . longer runs.

To attain the greatest productivity at low cost from Resin Industrial Cloth, attention must be closely centered on its correct selection and utilization. Our field men are fully informed and experienced. It is only logical to ask their advice on your particular application. They will be glad to cooperate.

New Development in High Speed Snagging Wheels

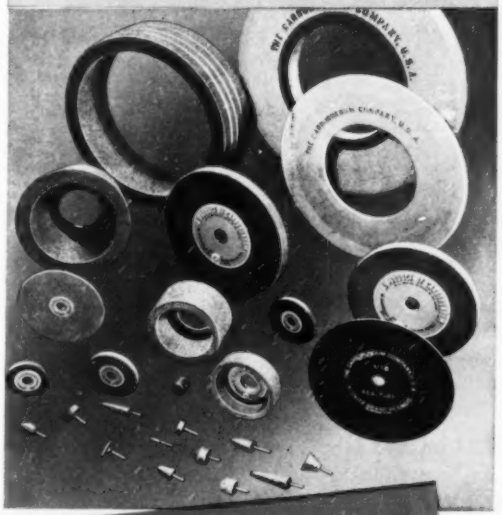
B-5 and B-7N are a recent development in ALOXITE aluminum oxide resinoid bond wheels that represent a major advance in high speed snagging. Actual operating experience in foundry, mill, forge and welding shop operations confirms a long list of advantages. A cutting rate as high as 9500 surface feet per minute is maintained continuously throughout the extended life of these wheels; primarily because the tendency to load is much less than with previous wheels of this type. A maximum degree of safety is provided the operator under severe conditions. Speed tests to destruction reveal a much higher mechanical strength while field tests show greatly improved resistance to heat and mechanical shock.

On the less severe applications, the relatively softer bond B-5 provides faster cutting and delivers greater efficiency. The tougher B-7N is more efficient on severe operations and lasts longer. As further proof that this strength and toughness do not detract from grinding efficiency, more than a few operating reports show savings up to 50% realized where correct selection and application has been made. The experience and knowledge that fostered the development of these wheels is available, through our men in the field, in selecting the correct grit and grade to produce such results.

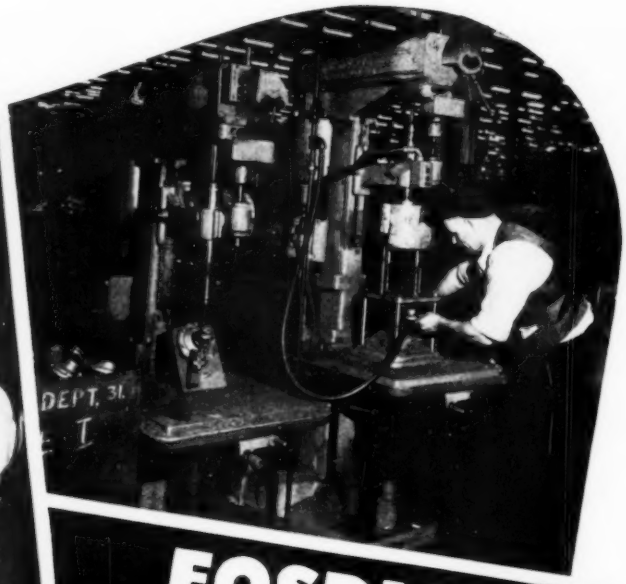
For prompt attention to abrasive problems, call your nearest branch office of The Carborundum Company.

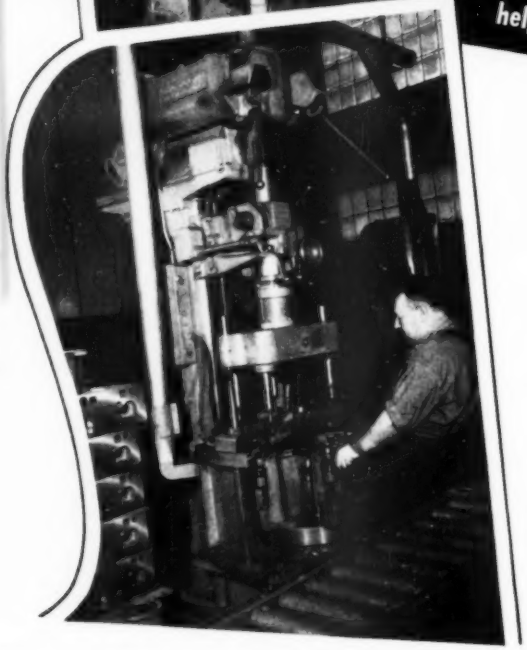
COATED PRODUCTS — SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS — ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS



FOR EVERY ABRASIVE APPLICATION
. . . CALL IN
CARBORUNDUM
TRADE MARK





FOSDICK
SENSITIVE AND UPRIGHT DRILLS
help boost production in automotive plant

● The accompanying illustrations show how a prominent automobile manufacturer uses Fosdick drills to keep production rolling.

The illustration at the top shows two Fosdick Sensitive Drills in operation. Note one of the machines is equipped with a drill head for drilling two holes simultaneously. The other machine in this photo shows the work mounted on an angular fixture for drilling an angular hole in the piece.

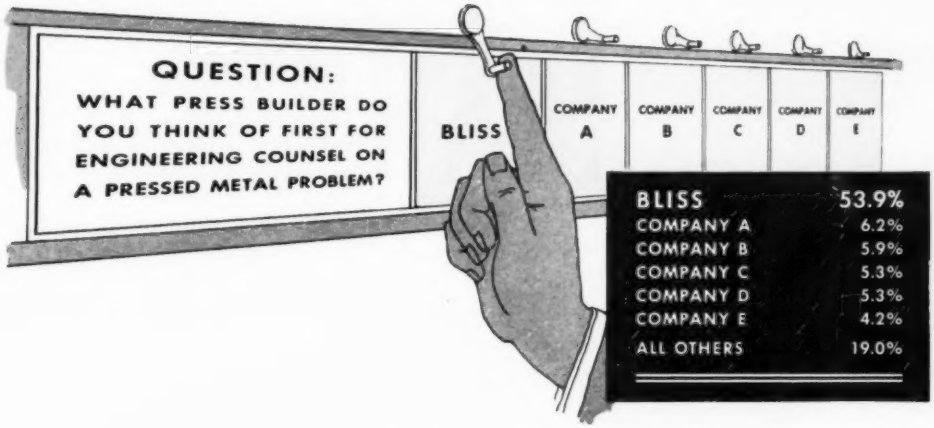
At the left top is a Sensitive drill with a drill head which is drilling two holes and reaming a third at the same time.

The Upright Fosdick Drill at bottom left is also equipped with a four spindle drill head for drilling all holes in one operation.

These are typical of the various kinds of operations being performed in hundreds of plants on Fosdick Sensitive and Upright Drills. If you have holes up to 1½" diameter you'll be interested in the Fosdick Sensitive and the Upright for larger diameters.

For complete details of design and construction Fosdick Upright Drill Bulletin UDA and Sensitive High Speed Drill Bulletin HSA is available.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO



How press users voted on this vital question

These returns from a recent impartial survey, conducted among press users ranging from the smallest to the largest companies, tell the story in ballots—"BLISS"—by a wide margin.

Such overwhelming preference for "BLISS" is confirmed on pressed-metal production lines everywhere. Let's look at just a few case examples:

97% of Hudson Motor's presses are Bliss-built.

100% of Florence Stove Company's presses at the Lewisburg, Tenn., plant are Bliss.

70% of Young Radiator Co.'s presses are Bliss.

325 Bliss presses in the Murray Corporation of America's plants.

318 Bliss presses at Stewart-Warner.

This continuing vote of confidence for Bliss equipment is duplicated in every major pressed-metal producing industry. It's so because at Bliss, a 90-year fund of press-building and stamping knowledge is continually at work developing the ways and means of increasing productivity of both operator and machine. You see the end results in modern, easy-to-operate equipment with automatic feeding, indexing and ejecting features along with longer die life and reduced maintenance.

Bliss engineers are actively engaged, too, in solving the new problems in the field of light metals and powder metallurgy, where the factors governing the forming, forging, drawing and stamping of steel, copper and brass do not apply.

You can put this pressed-metal knowledge to work by sending for a Bliss sales engineer today.

See our Catalog in Sweets or write for Bulletin 35-B

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

A section of the engineering department at Bliss' Toledo plant.

BLISS BUILT — MARQUETTE • BLISS • CONSOLIDATED • TOLEDO

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

"MARVEL" *HAS the edge*

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high-speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production, and lower cost per cut, come the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—they will not shatter.

Ask your local MARVEL distributor (see classified phone book, to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary high-speed steel blades.

1. High-Speed Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is positively unbreakable.

ARMSTRONG-BLUM MFG. COMPANY

"THE HACK SAW PEOPLE"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, U. S. A.**

MARVEL *Metal Cutting* SAWS

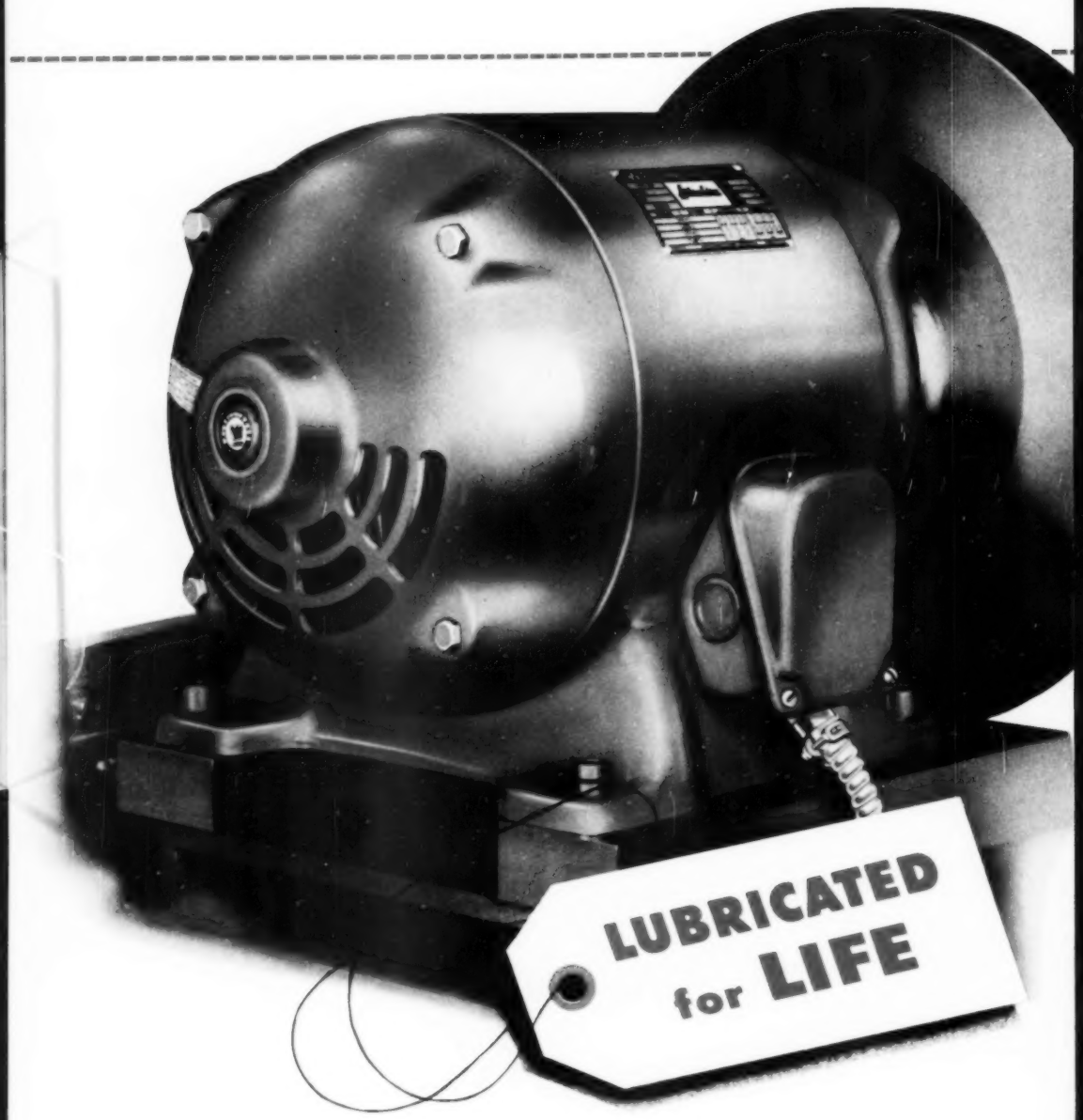
Better Machines–Better Blades

Life-Line

NOW... LUBRICATED for LIFE

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



do away with lubrication costs

FOREVER

Forget old-time ideas about the care and greasing needed to keep motors running!

Life-Line motors now eliminate the time and cost required for lubrication—for life! Life-Line double-width ball bearings are prelubricated with a more-than-ample supply of specially-treated lubricant—and factory-sealed to keep dirt out and grease in, for *the life of the bearing.*

Periodic weekly or monthly greasing schedules can be dispensed with. Motors may be installed in inaccessible locations; machines no longer need be disassembled to reach motors for greasing. Winding failures caused by overlubrication, and failures caused by use of improper lubricants, can be prevented.

Multiply these advantages by the number of motors in *your* plant. You'll find they offer new and important savings—in labor costs, in machine down-time, in motor outage costs. Then get in touch with your nearest Westinghouse office today. Most standard Life-Line motors are now available from stock. Others are available on short delivery schedules. Ask for details on your requirements. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

Westinghouse Life-Line Motors

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Tough lubrication job?

NOT WITH MOTORS

LUBRICATED for LIFE

It costs money to "baby" electric motors with constant greasing attention, whether it's a few or a few hundred.

That's why Life-Line motors offer new and important savings in plants like this one using 119 Life-Line vertical motor drives, and in any others using a-c motors from 1 to 50 horsepower.

Life-Line motors cut down operating costs every day, every week, they are in service, because they need *no* lubrication—*for life.* Sealed, pre-lubricated bearings insure long life—reduce motor outages caused by overlubrication and underlubrication—reduce machine shutdowns and lost production.

Check your Westinghouse representative today for prices and delivery on your requirements. Standard ratings available from stock—others on short delivery. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-21494

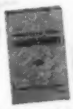
Westinghouse

Life-Line

Motors

Litho in U. S. A.

SOUR ON IT!

Machining heavy metal castings hogged the profits of a dictating machine manufacturer. Competition was forcing him to a lightweight model. He knew magnesium was light and strong, but was sour on it. Then he took his problems to Aluminum Company of America, light metal headquarters. He learned simple shop practices make handling magnesium no problem.* He found that fellow manufacturers every month are using over a million pounds of magnesium. He learned magnesium castings machine fast and have a high strength-weight ratio. He got books on designing  and fabricating magnesium, plus all the technical aid he needed. Now, he buys magnesium sand and permanent mold castings from American Magnesium Corporation and gets prompt delivery. Machining and handling costs dropped, profits soared. His new lightweight model squelches competition.

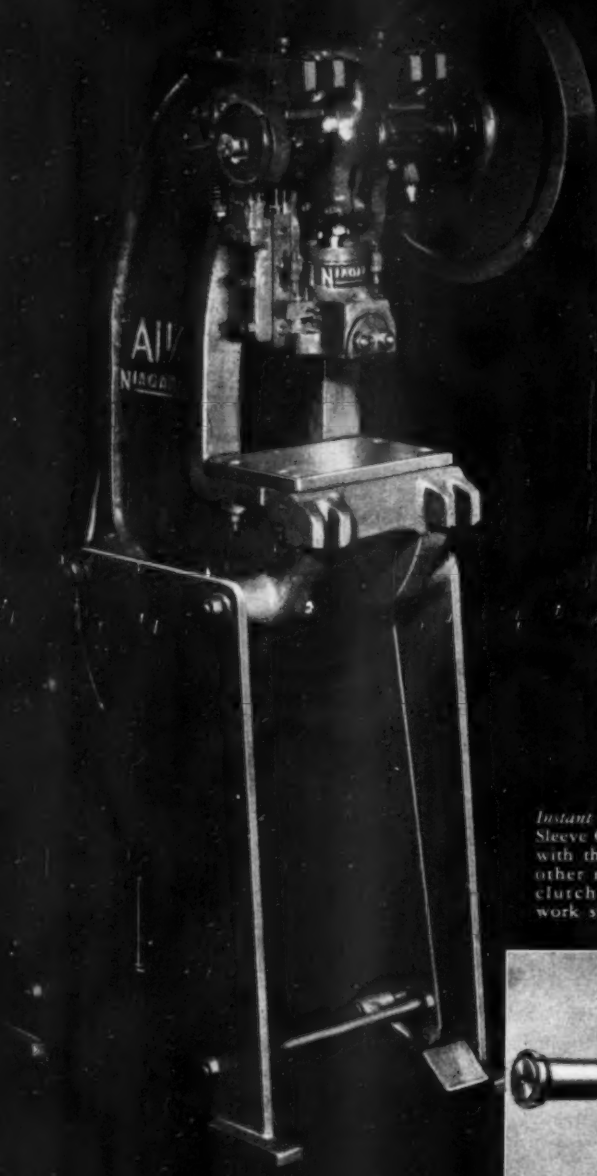
*No change in insurance rates.

These two, free books on magnesium and our broad technical experience can help your products, too. Write Aluminum Company of America, sales agent for American Magnesium Products, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO® PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

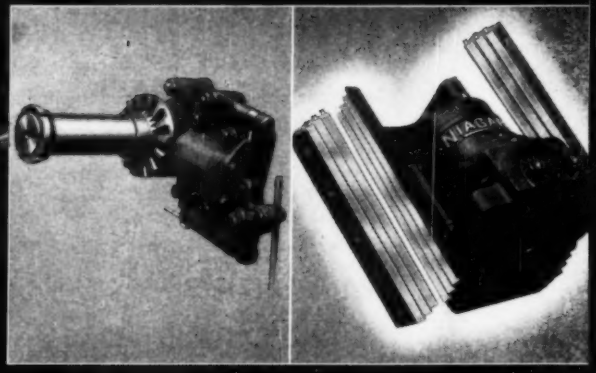


ONLY

● You get the same advanced design in small Niagara Inclinable Presses as you get in the largest sizes. Don't overlook the importance of this because small presses run as much as 6 times as fast as large presses. Regardless of size you get quality when you get Niagara Inclinable Presses.

Instant Engagement of the Sleeve Clutch as compared with the slower action of other mechanical press clutches produces more work strokes per hour.

Multiple "V" gibs provide more guiding surface which minimizes wear, maintains alignment of slide with bed and and thus increases die life.



NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

NIAGARA

SMALL INCLINABLE PRESSES

Give you all these

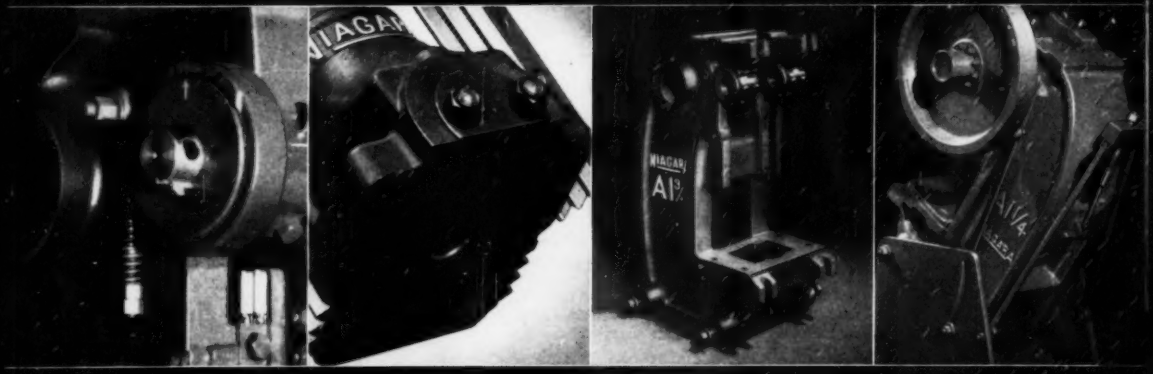
BIG PRESS FEATURES

Brake automatically compensates for wear as well as expansion due to heat of operation. Drum and band marked to indicate correct adjustment.

Slide designed to assure solid backing for die from center to front as well as rear. Breech block die clamp gives solid backing to punch shoe.

Frame designed to provide solid gib mountings . . . strength at the crankshaft bearingsand a rigid gap maintaining close alignment of punch and die.

Inclining mechanism easily operated by one man. Working height is not materially changed when press is inclined.

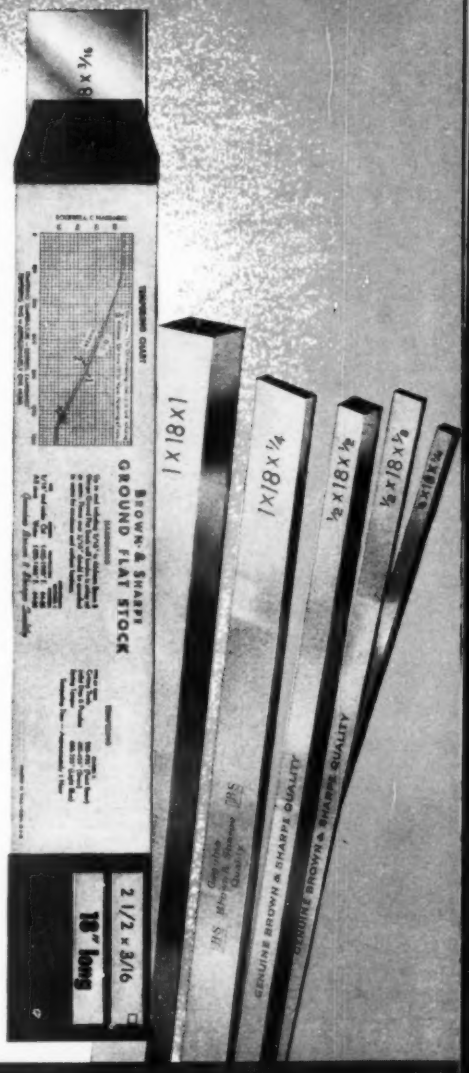


DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

An Important Cost Saver!

for templates, cutting tools, gages, test tools, machine parts and many other items . . .

Brown & Sharpe GROUND FLAT STOCK



SAVE TIME . . . SAVE MONEY

Here's one way to beat high costs. By making small parts from stock accurately pre-ground to size, you can avoid expensive, difficult grinding operations. What's more, you save man-hours and machines for more profitable work.

Brown & Sharpe Ground Flat Stock is accurate to within .001" in thickness. It is selected first-quality tool steel, annealed uniformly by a special process to make machining easy. Up to and including 3/16" in thickness, hardens in either oil or water to 64-66 Rockwell C. Pieces over 3/16" should be quenched in water for full hardness.

Brown & Sharpe Ground Flat Stock in 18" lengths is available in sizes that cover most requirements. Get an adequate supply from your Brown & Sharpe distributor. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Regular stock sizes include 13 different thicknesses from 1/64" to 1/2" . . . widths up to 6" . . . also square sizes. Individually packaged in clean, protective envelopes marked with size and heat treating instructions. Easy to store. Easy to handle.

We urge buying through the Distributor

BROWN & SHARPE

THE GREENFIELD STORY

of Service and Quality

"Built-In"

THE tap is not a tool whose value can be told by its looks. It is only in its performance that its merit becomes manifest. If it threads thousands of holes at high speeds with undeviating accuracy, it is a good tap. Its true value is built into it by the maker in his selection of steel, his workmanship, and his refinements of design that are rarely visible to the eye. There is, we believe, still another important "built-in" value in "Greenfield" taps. It is the service which is available to the tap user from the distinguished list of distributors who stock the "Greenfield" line from coast to coast; and the on-the-spot help which is available from the trained "Greenfield Man" on any threading problem at any time. *Such "built-in" values are an important chapter in the "Greenfield" story of service and quality.*

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP.
Jackson, Michigan

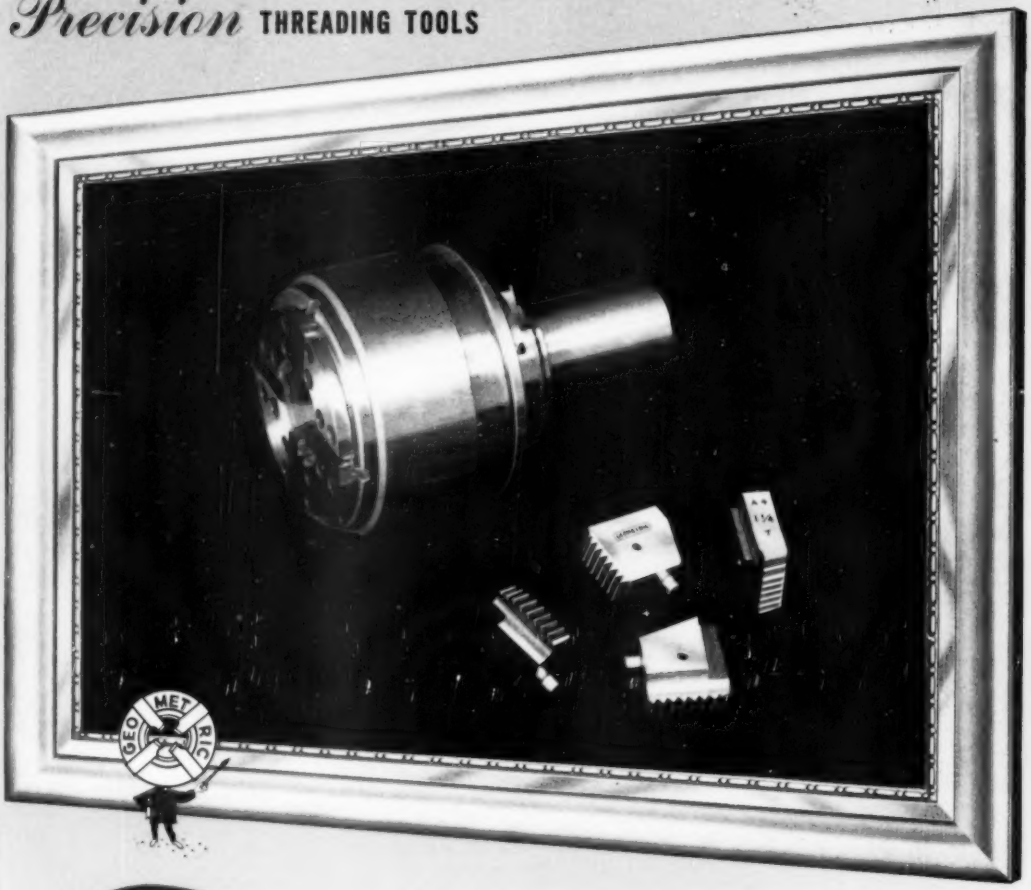
Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision THREADING TOOLS



Rotary Style KD Die Head and Chasers

This Self Opening Die Head is for use on live spindle machines, particularly automatic screw machines.

★ ★

Available in six sizes, with a cutting range from 1/16" to 2½".

★ ★

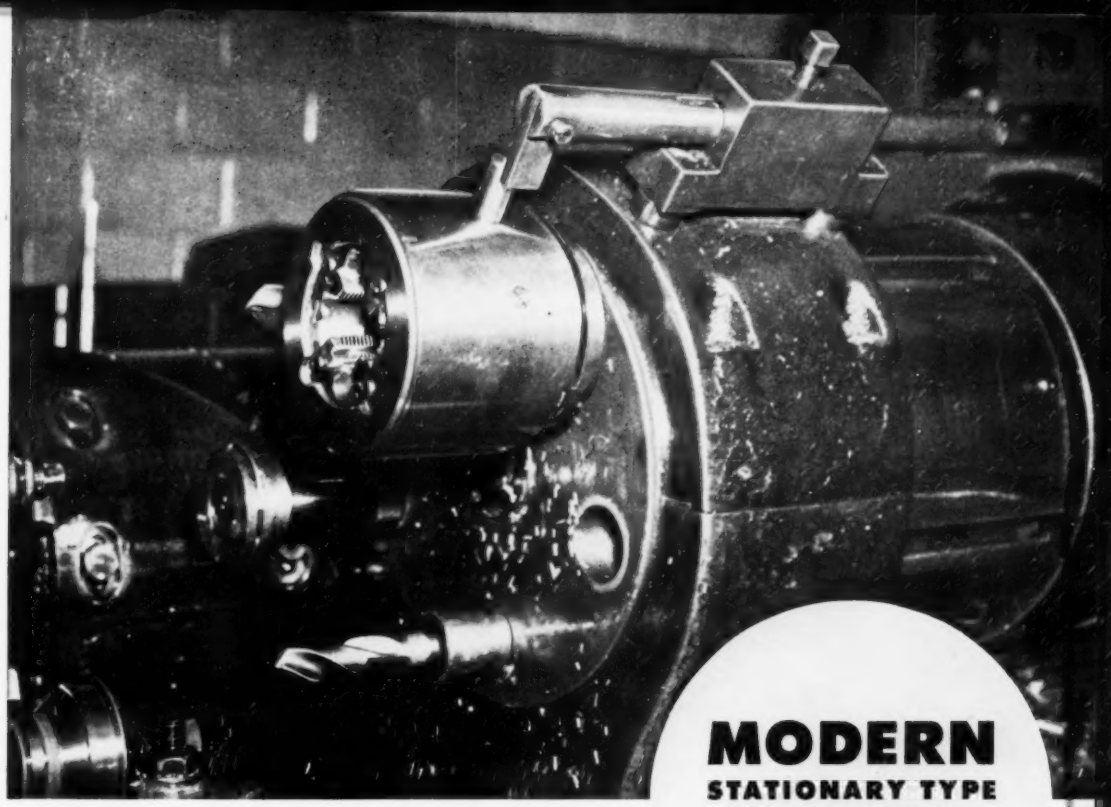
GEOMETRIC also makes a complete line of Self Opening, Stationary and Solid Adjustable Die Heads — and Collapsing and Solid Adjustable Taps. *Write today for further details.*

"Be Sure ... Buy Geometric"

THE
GEOMETRIC
TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

GTD

GTD AMPCO



MODERN
STATIONARY TYPE SELF-OPENING
DIE HEADS

Here a Modern Stationary Type Self-Opening Die Head is shown in operation on a Cleveland Automatic. The die head's floating shank compensates for any difference between the lead of the cam of the machine and the thread to be cut.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

The line of standard Modern Stationary Type Self-Opening Die Heads thread diameters from 1/8" to 7" in standard heads and up to 14" in special heads, accurately, fast and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes and other machines where the die head is used in a stationary position and the work revolves.

Complete information will be furnished upon request.

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

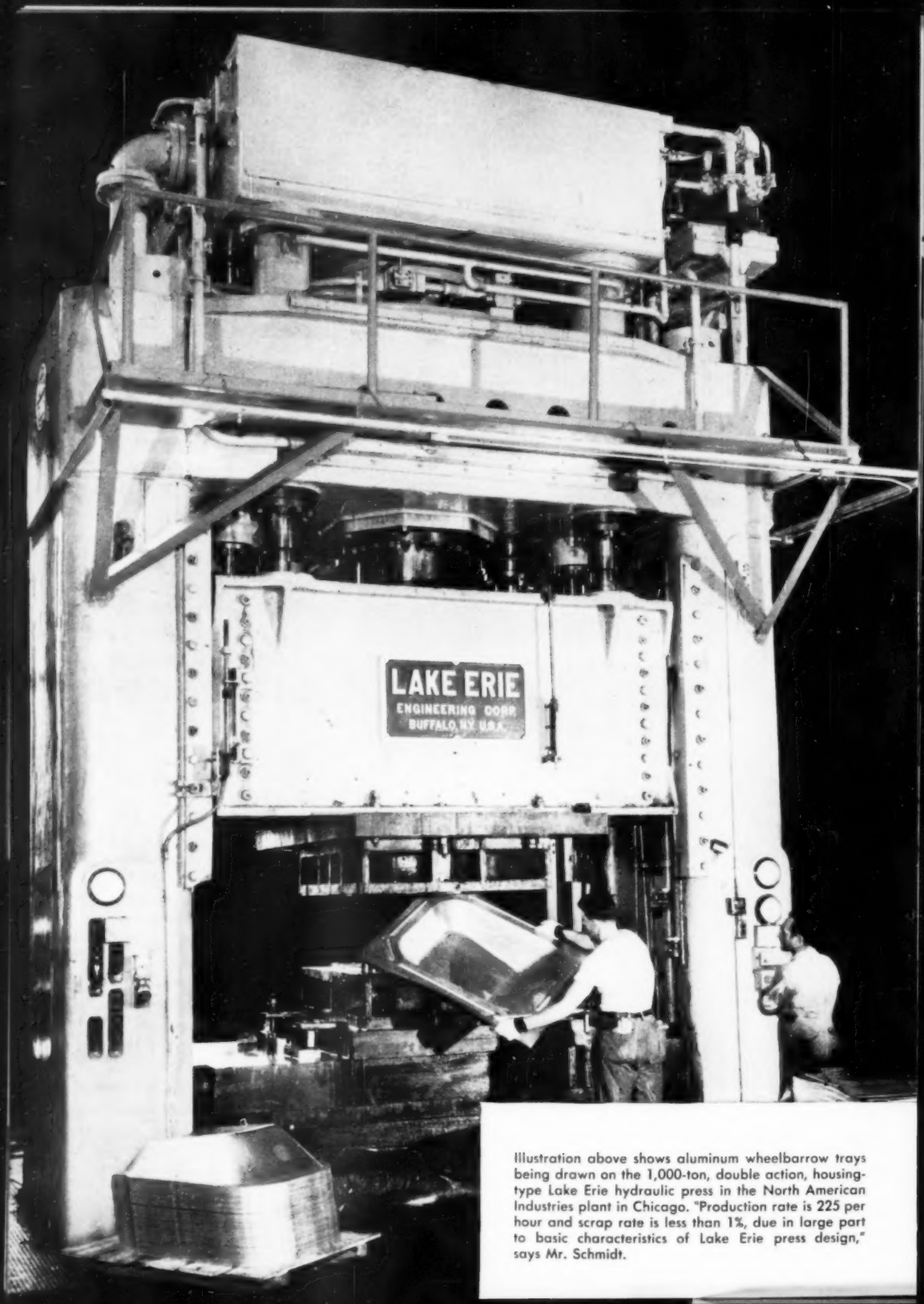


Illustration above shows aluminum wheelbarrow trays being drawn on the 1,000-ton, double action, housing-type Lake Erie hydraulic press in the North American Industries plant in Chicago. "Production rate is 225 per hour and scrap rate is less than 1%, due in large part to basic characteristics of Lake Erie press design," says Mr. Schmidt.

NORTH AMERICAN INDUSTRIES
deep draws 225 large pieces per hour
on LAKE ERIE Hydraulic Press

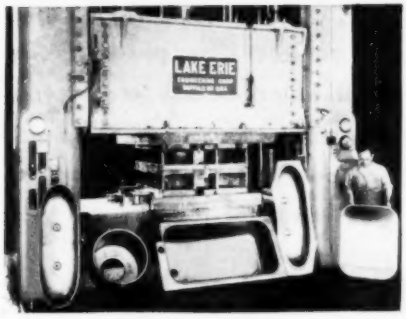
LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

"Rapid approach and return strokes combined with fast drawing speed even at maximum tonnage makes high production rate possible,"
Says **THUR SCHMIDT**, General Manager

If you are searching for ways to step up production, improve quality or lower your costs...the accomplishments of this 1,000-ton Lake Erie Hydraulic Press are worth contemplating. It does with ease and precision, in a single fast action, jobs that are either impossible or require multiple operations by other methods. Many top-flight manufacturers are already using this Lake Erie design and can tell you plenty about its speed and versatility. Space doesn't permit us to list the users or complete specifications of this design which is available in capacities of 400-tons and up. But we'll be glad to forward any data you desire if you care to look into the matter further.

LAKE ERIE ENGINEERING CORP.
MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY
General Offices and Plant:
507 Woodward Avenue, Buffalo 17, New York
DISTRICT OFFICES IN NEW YORK, CHICAGO AND DETROIT
Representatives in Other Principal Cities in the United States and Foreign Countries

"The one-piece bath tub stampings shown above are drawn cold in a single operation to a depth of 15" from 14 gage steel. "Consistent success has been achieved with both hot-rolled and cold-rolled mild steel, aluminum and stainless steel," says Mr. Schmidt.



A wide-range of products, some of which are shown at left, are drawn on this versatile Lake Erie press. Runs of as high as 60,000 pieces have gone through the press. "An important feature of the press," says Mr. Schmidt, "is the ease with which adjustments for stroke, tonnage and gage variation may be made when necessary during the course of production runs."

★

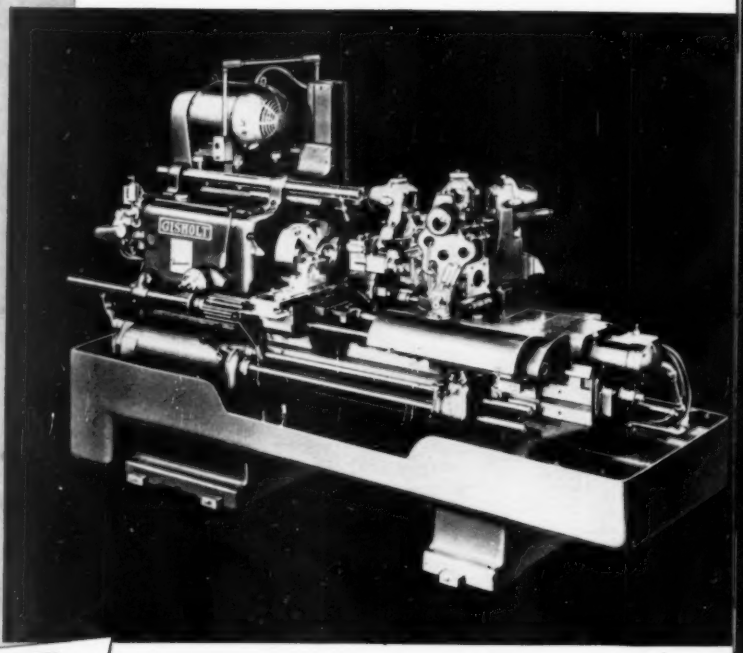
The North American Industries wheelbarrow at right is light, strong, attractive and perfectly balanced.

LEADING MANUFACTURER OF HYDRAULIC PRESSES—ALL SIZES AND TYPES—METAL WORKING...PLASTICS MOLDING FORGING...METAL EXTRUSION...PROCESSING...RUBBER VULCANIZING...STEREOTYPING...SPECIAL PURPOSE

GISHOLT

FASTERMATICS

AUTOMATIC TURRET LATHES



FASTER operating cycle

FASTER speed changes

FASTER feed changes

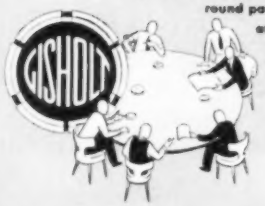
FASTER job set-ups

FASTER production

If you have work calling for a maximum number of surfaces to be machined in one chucking — investigate the Fastermatic. Six turret faces and two independent cross-slides provide a degree of flexibility not found in any other type of standard machine of comparable size. Completely automatic operation gives you the speed to cut costs on a wide range of jobs. Write for the Fastermatic catalog.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

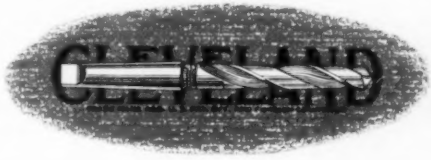
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Choosing the Right Stock Drill

- **Cuts Your Cost Per Hole**
- **Eliminates Breakage**
- **Speeds Production**

Yes, there are many advantages in selecting the right drill for each job. For instance, one of our customers was getting excessive breakage with regular jobbers' length drills on the set-up pictured here—drilling holes 7/16 inch deep in stainless steel. A *Cleveland* Service Representative was able to correct this situation by recommending a stub screw machine drill which, because of its heavier construction and shorter length, is giving complete satisfaction. *Your* drilling problems, too, perhaps can be solved by a *Cleveland* Service Representative—without cost or obligation. Contact our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor



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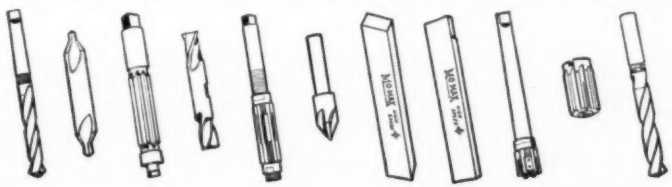
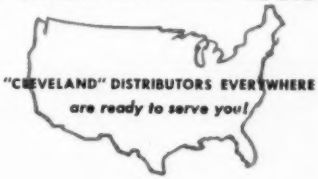
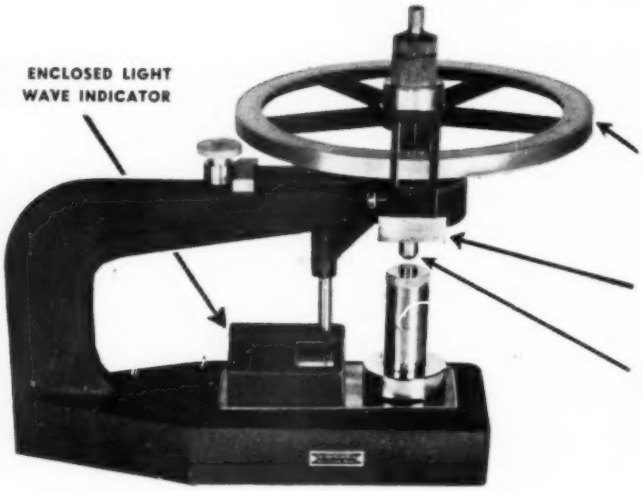




THE NEW Van Keuren 0 to 3" LIGHT WAVE MICROMETER

will improve your product



CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy".

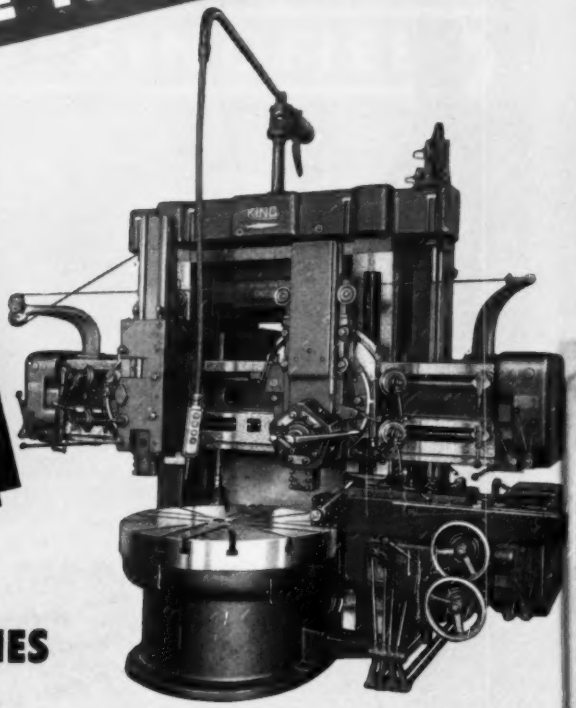
The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

YOU CAN MAKE SAVINGS LIKE THIS*



WITH THE NEW SERIES

KING

* APPROXIMATELY 35% TIME SAVING

over previous methods. That's the notable result reported by a large mid-western manufacturer of construction machinery, when this cast steel chain sprocket gear was machined on their new 52" KING Vertical Boring & Turning Machine. As shown above, all three heads operated on the work simultaneously. Convincing evidence of the smooth power and rigidity in the New Series KING!

On other production jobs such as machining large cast iron drum and brake housings, alloy steel gear blanks, large cast steel transmission housings, etc., this ruggedly built, soundly engineered KING produced similar savings in labor and production time.

If you, like this prominent manufacturer, are placing more and more emphasis on lowering costs of production, you will be interested in the ability of the New Series KING machines to handle your vertical boring and turning jobs with maximum efficiency, in minimum time.

Investigate the KING for speed . . . power . . . rigidity . . . accuracy . . . ease of control. Ten sizes are available: 30", 36", 42", 52", 62", 72", 84", 100", 120", and 144". Write for bulletins giving complete specifications.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

"what the BADGER thinks of the CUB"

BADGER Tool and Engineering Company

4040 NORTH 34TH STREET
MILWAUKEE 9, WISCONSIN
TELEPHONE HILLTOP 0595-6

December 17, 1948

G. A. Gray Company
Cincinnati, Ohio

Gentlemen:

For the past five months we have had in operation in our plant a gray 36" x 12' Openside Cub Planer.

It may be of interest to you to know that even though our plant does short run jobbing work we find this to be an excellent investment.

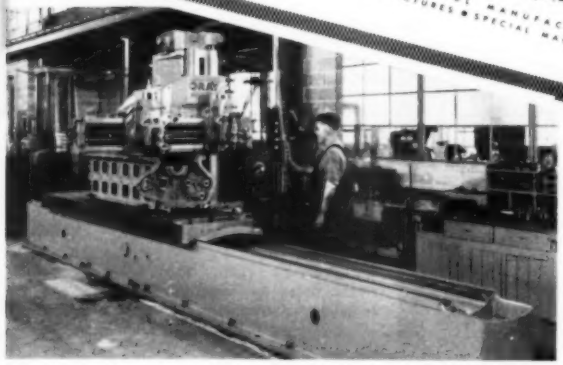
Since putting our Gray into service, we find this equipment opens to us a much greater scope of operation due to its rugged construction, speed, simplicity of operation and the high quality of accuracy obtainable.

We strongly recommend the Gray Cub for job shop operation.

Very truly yours,
Badger Tool & Engineering Company
Roland Bauch

RAB:ds

DESIGNERS AND TOOL MANUFACTURERS
TOOLS • JIGS • FIXTURES • SPECIAL MACHINERY



GRAY PLANER CUB

BETTER INVESTIGATE THE *New* GRAY OPENSIDE PLANER CUB

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

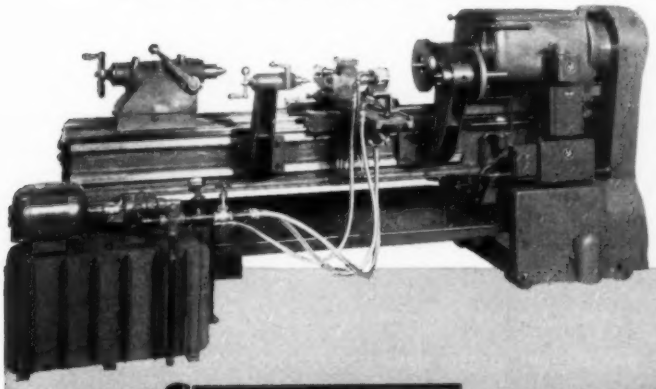
CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

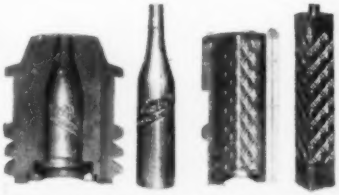
WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure **accurate** three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do.





Just two examples from many of the accurate reproductions from Springfield Reproducers. Letters and figures reproduced from the master; intricate designs reproduced on flat surfaces.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

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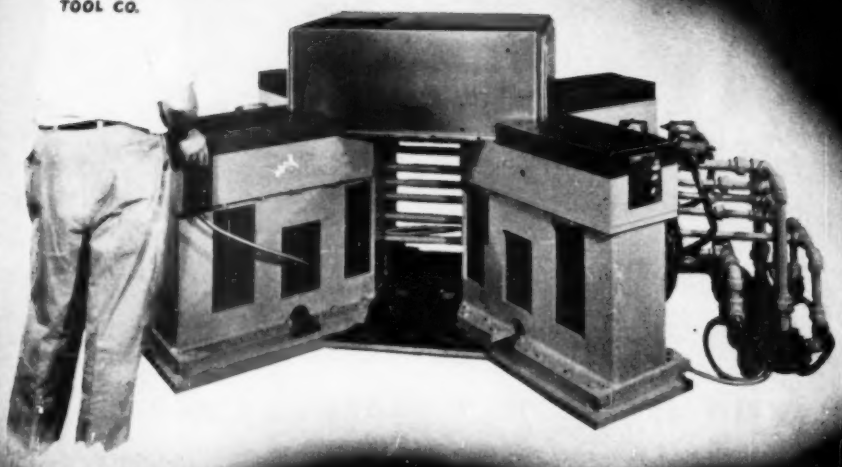
Exclusive Representatives in All Principal Cities

RELEASE PRESSES AND $$ FOR OTHER WORK

Vulcan TOOL CO.



CORNER SIZE AND FINISH FORM MACHINE

finishes four corners at a time

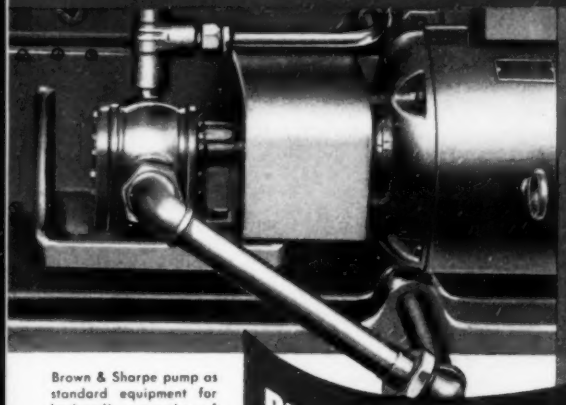
Vulcan Hydraulics
- Form
- Pierce
- Flange
- Assemble
- Size

Vulcan's conception of an Hydraulic 4 corner size and finish form machine is herewith presented with the thought that manufacturers troubled with high cost slow production runs of panels, liners, doors, must consider the use of Vulcan's completely unified Hydraulic Machines. They need but one operator. The present machine releases a punch press (and the capital it represents) for other work. Special sizing fixtures and multiple manpower are unnecessary. Engineered and built to your specific product needs, the work is performed quickly (7 seconds) and economically, with all four corners sized and finished simultaneously.

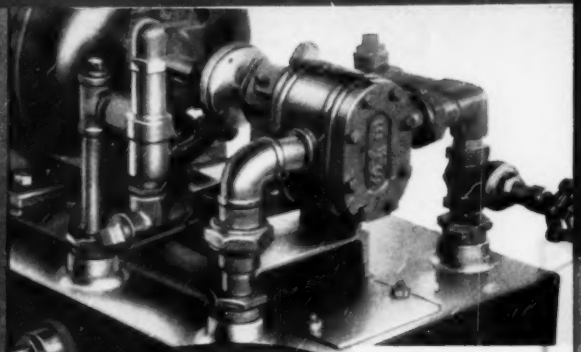
The Hydraulic Machine principle for Die operations can be utilized in many forming, piercing, flanging, sizing applications. Mail us your product part prints for our advice or quotation. No obligation.

Vulcan Tool Co.
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

RIGHT in their element . . .
ON HYDRAULIC SYSTEMS

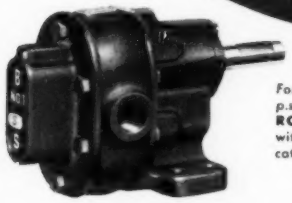


Brown & Sharpe pump as standard equipment for hydraulic operation of machine tool.

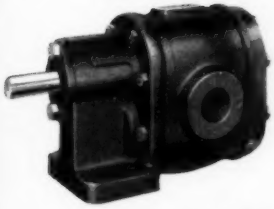


Compact installation of Brown & Sharpe pump for hydraulic operation of stoker unit.

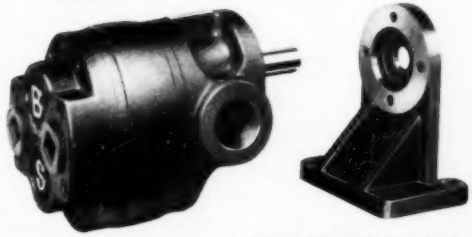
BROWN & SHARPE Rotary Geared PUMPS



For pressures up to 100 lbs. p.s.i. . . . **NOS. 1S, 2S and 3S ROTARY GEARED PUMPS** with helical gears. Self-lubricating.



For pressures up to 200 lbs. p.s.i . . . **NOS. 53 and 55 ROTARY GEARED PUMPS** with roller bearings and helical gears.



For pressures up to 500 lbs. p.s.i. . . . **500 SERIES ROTARY GEARED PUMPS**—six sizes—with Herringbone Gears. Needle bearings, ground joints, alloy steel shafts, reversible back drain for reversing rotation. All moving parts balanced hydraulically . . . the 4 larger sizes, are balanced mechanically also. Foot-type mounting brackets available to meet practically any mounting condition.

Because these rotary geared pumps are specifically designed for hydraulic service, their features show up to advantage in daily operation. They are simple, compact, dependable and quiet. Their gears are made with extreme accuracy . . . to standards that characterize Brown & Sharpe machines and equipment. All have a mechanical seal designed to prevent leakage and eliminate gland adjustments. Everything about these pumps . . . design, materials, and manufacturing . . . is the result of long experience in meeting pump requirements for machine tools and other machine equipment.

Thousands of these pumps in daily service are giving performance that proves they are RIGHT in their element on hydraulic systems. Get complete information and specifications. Write for Pump Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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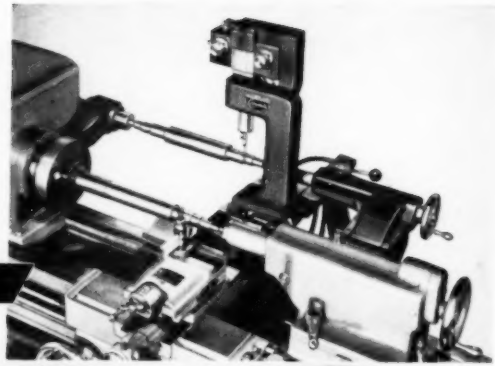
We urge buying through the Distributor

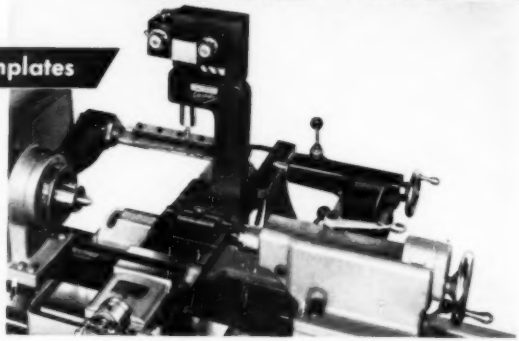
BROWN & SHARPE PUMPS

GET INSTANT CHANGEOVER...

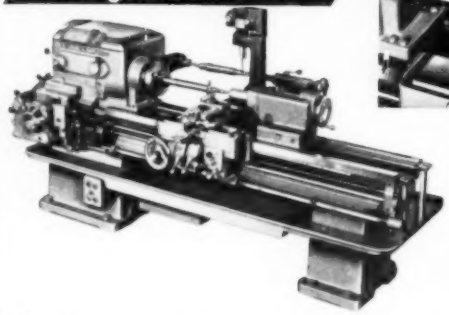
Duplicating from round templates



or Duplicating from flat templates



or Regular lathe work

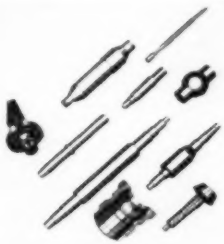


with the *NEW* Lodge & Shipley COPYMATIC!

IT TAKES JUST A MINUTE to change from regular lathe work to automatic tracer controlled duplication (or vice versa). There are no attachments to take off... no gadgets to put on.

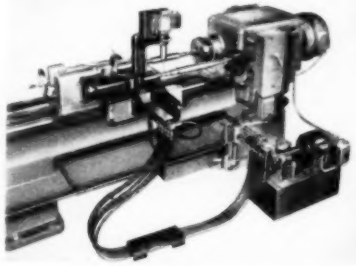
Using either flat or round templates, the COPYMATIC reproduces square shoulder faces, grinding necks, tapers in both directions, chamfers and curved contours with a high degree of accuracy. Often, the need for a special template is eliminated... the first piece of a lot may be produced by standard lathe operation, inserted in the holder and used to produce the rest of the lot automatically.

The COPYMATIC offers all the convenience and speed of hydraulic duplication, with all the versatility of the highly efficient Lodge & Shipley "Model X" Lathe. This double adaptability of the COPYMATIC takes it out of the special purpose machine classification, makes it a profitable producer for any size shop. Ask your Lodge & Shipley Representative for additional details or write for Bulletin #675.



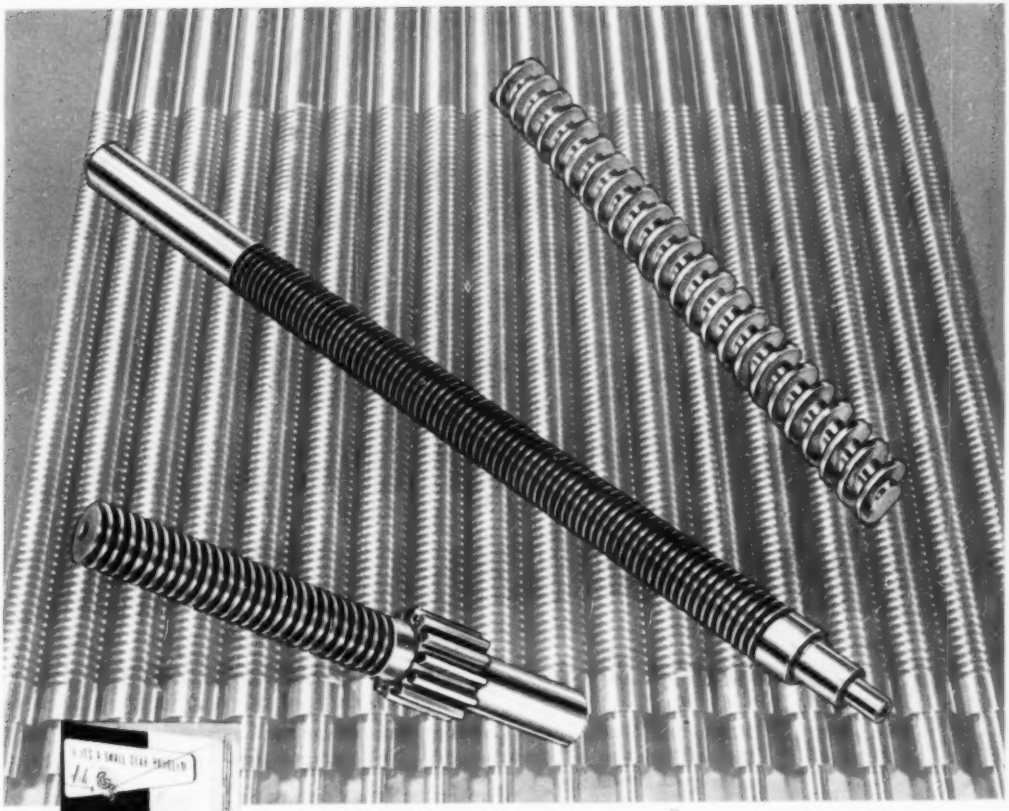
• *Right:* A few samples of the wide variety of shapes produced by the COPYMATIC... both turning and boring operations are performed to very close limits.

• *Below:* Rear view of COPYMATIC, showing hydraulic power unit and mounting for template.



THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



FREE . . . 4-page catalog bulletin illustrating many different types and applications of G. S. Small Gearing. It may offer valuable suggestions and ideas that you can use. Write today.

Get BETTER Low Cost Gearing!

IT'S TRUE, we've developed the *mass production* of Fractional Horsepower Gearing to an unusually high degree of perfection. Yes, we've been doing nothing else for more than thirty years! Therefore, some buyers believe that we do only the intricate, more costly jobs. Far from it! . . . We're just as well equipped to mass produce simple, low cost gears. So, regardless of the *nature* of your small gearing problem, *put it up to G. S.* Let our skilled engineers help you. Send drawing or samples. See why so many of our country's most particular small gear buyers depend upon G. S. for *all* of their requirements.

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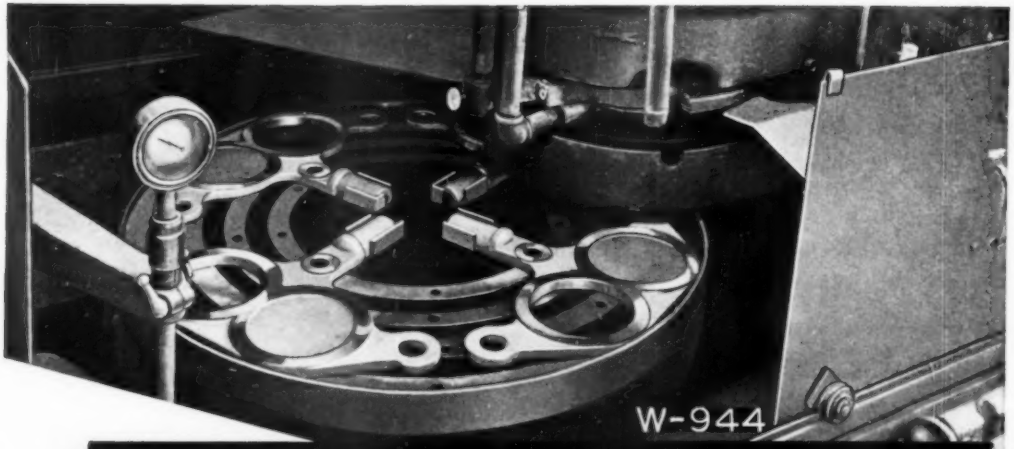
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS



PUT IT ON THE BLANCHARD

(*No objections to parts with projections!*)

The Job: Grinding both sides of cast iron shutters for high vacuum service—removing $\frac{1}{16}$ to $\frac{1}{8}$" stock per side. *This part was formerly milled and scraped.*

The Method: Place 4 shutters (as shown) on the 36" magnetic chuck of a *standard* No. 18 Blanchard Surface Grinder. The fixtures necessary are the 4 unattached U-shaped steel brackets for blocking and concentric steel rings used to locate the pieces, the rings being placed over the magnetic poles of the chuck. Simply turn parts over to grind other side.

Blanchard Production: 8 pieces (16 surfaces) per hour—floor to floor.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

An important point to remember about BLANCHARD GRINDING is that IF THE SURFACE TO BE GROUND CAN BE BROUGHT TO THE WHEEL, A WAY CAN USUALLY BE DEVISED TO HOLD ALMOST ANY SHAPE OF PIECE.

In devising ways of holding and grinding parts with projections, Blanchard Engineers are ever ready to give every possible assistance. Avail yourself of Blanchard's Free Engineering Service—whether or not you already have a Blanchard Grinder. Simply send us the data, with samples if possible, for a prompt answer to your problem. You'll incur no obligation to purchase Blanchard equipment.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

BALANCING

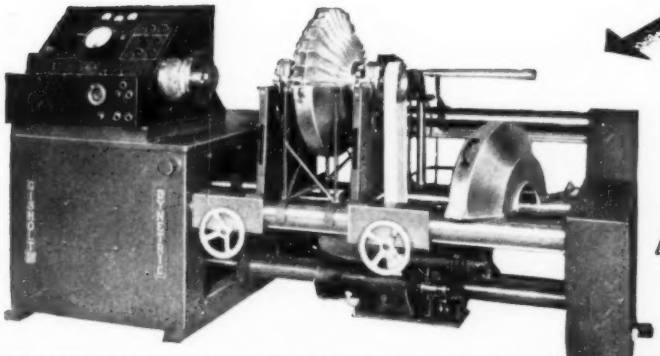
keeps pace with the jets!

Racing into the terrifying regions bounded by the speed of sound, the jet planes have also opened new frontiers in engineering. For example, the requirements for accurate balancing exceed all previous commercial standards. At the fabulous operating speeds of the turbo-jet impellers, the slightest vibration caused by unbalance can spell disaster.

It is significant that builders of American jet engines have turned to Gisholt Balancers for the unfailing accuracy required in this important work.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin



Gisholt DYNETRIC Type U Balancer, shown at left, can measure unbalance vibrations as small as 20 millionths of an inch on these turbo-jet compressor impellers.

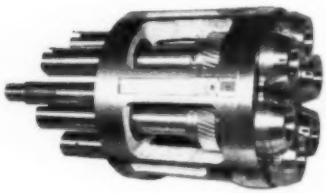
DYNETRIC BALANCERS GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. DYNETRIC IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MAINTENANCE BEGINS WITH DESIGN

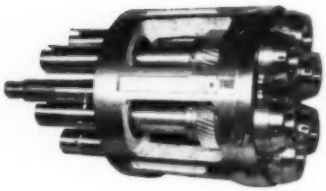
Buyers look for the "hidden dollars saved" in good Machine Design. They know it pays to see beyond a purchase price that might turn out to be a mere down-payment. Upkeep and replacements can be very costly.
Builders of multiple spindle automatics know the importance of a well-designed work spindle carrier. It has been referred to as the "heart" of accuracy. If you are an automatic user, you can quickly check on the maintenance dollars to be saved through the design of the Conomatic Carrier.



INTEGRAL

DRUM TYPE

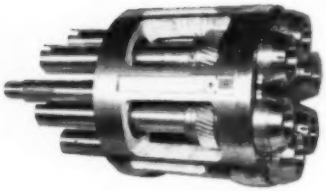
Heavily ribbed, integral, drum shaped design, for adequate resistance to torsion strain under the heaviest of loads.



GREATER

LENGTH

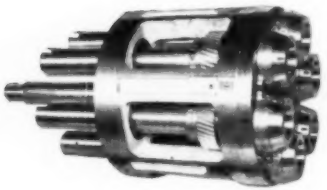
Greater length, for better alignment of work and for greater bearing area of work spindles. Driven gears in balanced position for better distribution of load on spindles and bearings.



TAPERED

FRONT BEARING

Exclusive tapered front bearing for the only combination radial and end thrust take-up facility provided by any multiple spindle automatic carrier. It is an important safeguard against deflection.



FREE OF

CROSS SLIDE PRESSURE

Rugged support of work, and relief from cross slide pressure by the block measurement positive stop provision against the machine frame, insure the maintenance of form tool and endworking tool operations to closer limits and quality finish.

#4

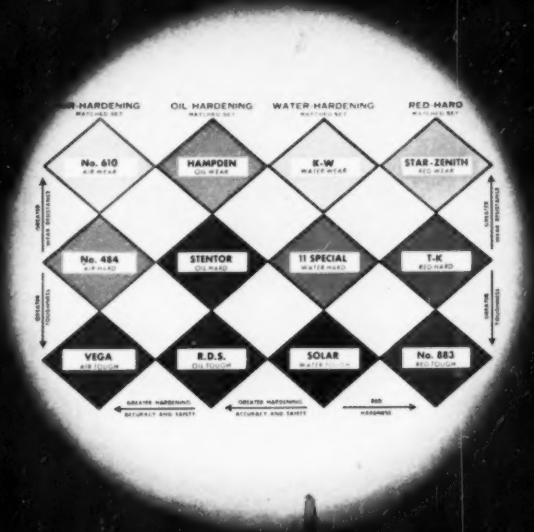
A comparison with ALL Automatics
will lead you to

Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

New!

a quick, positive way to identify tool steel bars!



NOW . . . CARPENTER MATCHED TOOL & DIE STEELS ARE PAINTED FULL LENGTH!

at last you can

- Quickly Identify Steels In Stock
- Reduce Your Own Marking Costs
- Eliminate Costly Stock Mix-Ups
- Simplify Inventory-Taking

Discover how this new marking system can help you . . .

THE CARPENTER STEEL COMPANY • READING, PA.

SEE OTHER SIDE

This New Marking Program Gives You

4 NEW WAYS TO REDUCE TOOLING COSTS!

1. QUICKLY IDENTIFY STEELS IN STOCK! No more "guesswork" when selecting steels from stock. Every Carpenter Matched Tool and Die Steel is now painted end to end with its own distinctive color.

2. REDUCE YOUR OWN MARKING COSTS! With this new marking method the identifying color *stays* with small pieces cut from bars, and on short lengths put back into stock.

3. AVOID COSTLY STOCK MIX-UPS! At last you can reduce the danger of using the wrong steel for the job—and ruining an otherwise perfect tool or die.

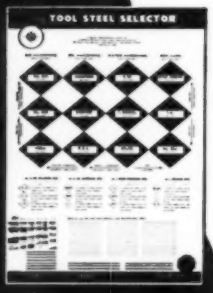
4. SIMPLIFY INVENTORY-TAKING! By knowing at a glance "which steel is which" you can speed-up inventory-taking, eliminate confusion in stocking, and reduce time spent handling tool steels.

NOW . . . A Complete, Simplified Program to Help You Get Better Tools and Dies!

Here, for the first time, is a complete program that helps you take the guesswork out of selection, identification, and heat treatment of tool and die steels. For many years tool makers have used the Carpenter Matched Set Method to simplify tool and die steel selection and heat treatment. Now going one step further, Carpenter's new bar painting system is your insurance against "mistaken tool steel identity". Each "diamond" on the new 12-color Wall Chart represents a steel in the Matched Set. By following directional arrows—"North" for extra wear resistance, "South" for greater toughness, etc., you quickly arrive at the one steel best suited for each job. Simply use the Chart to select the steel you need—then go to your stock rack and pick out the bar with the corresponding color. It's easy, saves time, reduces costs.

Start now to cash-in on all the exclusive benefits you get with Carpenter Matched Tool and Die Steels. Be sure your orders call for "Carpenter". Meanwhile, write for your Tool Steel Selector and Identification Wall Chart, now.

The Carpenter Steel Co., 109 West Bern St., Reading, Pa.



The new 21"x30" Tool Steel Selector Wall Chart now printed in 12 different colors to quickly identify each Carpenter Matched Tool and Die Steel.

© 1948 The Carpenter Steel Co. Printed in U. S. A.

Carpenter MATCHED TOOL & DIE STEELS

Painted Bars in Stock — Ready for Immediate Delivery!

Atlanta, Baltimore, Birmingham, Ala., Boston, Bridgeport, Conn., Buffalo, Chicago, Cincinnati, Cleveland, Dayton, Detroit, Grand Rapids, Mich., Hartford, Houston, Indianapolis, Kansas City, Los Angeles, New York, Philadelphia, Providence, St. Louis, Worcester, Mass. In Canada: Toronto, Montreal

Export Department, 233 Broadway, New York 7, N. Y. "CARSTEELCO"

SEE OTHER SIDE

MORE GEARS IN LESS TIME!

With

BARBER-COLMAN

"MULTITHREAD" HOBS

JOB FACTS

Operation—Finish Hob 12/14 Pitch Gears, 8 per load.
Machine—Barber-Colman No. 16-16.
Hob—Barber-Colman Ground "Multithread" Hobs.
Material—Steel forgings.
Feed—.54" rev. of work Speed—139 RPM
Fl-to-Fl—60 minutes per load.
Accuracy—Roll with master gear. Kickout within .002".

Finish, production, tool life — all 3 have improved with a changeover to Barber-Colman *"Multithread"* hobs on this finish hobbing operation. The use of *"Multithreads"* depends on machine conditions and the particular characteristics of the gears to be cut. Under the proper conditions, as in this case, more gears are produced in less time, with substantial production savings. This job, for example, shows 25% better finish, 24 more gears per hob setting, 10 more settings per sharpening, and production time cut from 95 to 60 minutes per load.

We are anxious to demonstrate what *"Multithreads"* can do for other production hobbing jobs, and we invite questions and job specifications. Ask your Barber-Colman representatives for an analysis of *"Multithreads"* on your jobs.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 319 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

METHODS ENGINEERS!

Get this free data on hob performance and accuracy, a complete case history record, without obligation. Send request on company letterhead for File No. 319.

...that wearing out an old machine is expensive

Of course, you know that an obsolete machine, even with its low carrying charges, usually costs more to run than a new one. Your treasurer probably knows that, too; but it won't hurt to remind him that the best time to replace old machines is before they are completely amortized on the books. For, an automatic five years old is dangerously below today's Acme-Gridley production standards.

If you have seen new Acme-Gridley Automatics in action, you know that doubled production is not uncommon. Maybe we could help you prove this point for your treasurer—by placing in your hands more case histories of the actual experiences of some of our customers—down-to-earth records of dollars saved with new Acme-Gridley Automatics. Here's a typical example:

CUT THIS OUT FOR USE WHEN YOUR TREASURER WANTS PROOF

AN ACME-GRIDLEY CERTIFIED CASE STUDY

THIS IS WHAT HAPPENED

MACHINE—2" RB-6 Spindle Acme-Gridley Automatic

PART TURNED—Steel Eccentric Bushing

MACHINING TIME—17½ seconds—for 15 operations

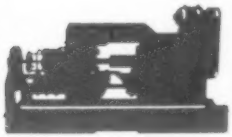
FORMER METHOD—Blank out on automatic, then, on second machine, finish eccentric shoulders, internal recess and gauge O.D.

PRODUCTION INCREASE—300%

AND HERE'S ONE IMPORTANT REASON

THE ACME-GRIDLEY CROSS SLIDE is rigidly supported, low in the frame, without overhang, and has easily adjustable gibs on hardened steel ways. This design provides direct contact between the drum cam and roll, and at the center of the slide. Positive cam control is insured and excessive linkage is avoided. Moreover, there are fewer parts to wear.

Generous open space around the slides gives more chip clearance, and more efficient operating convenience, through greater accessibility to tools—all factors that insure accuracy, increased production and lower costs.

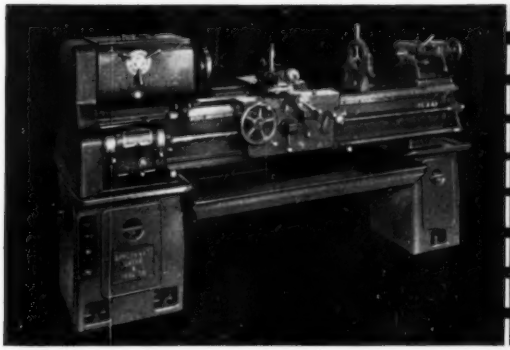


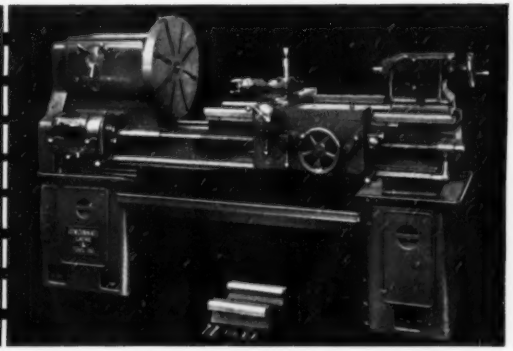
THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

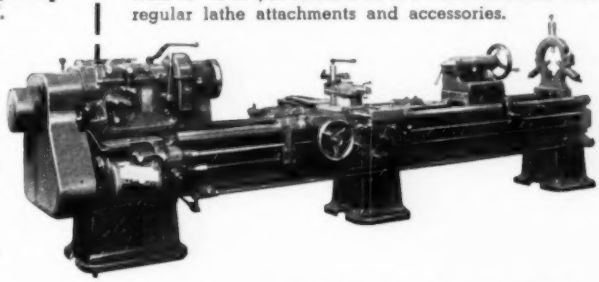
GET MORE... PAY LESS



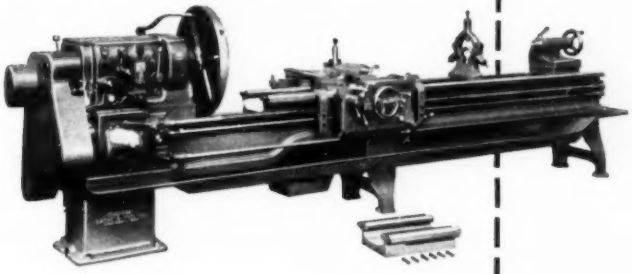


Lightweight Champ: The new Tray-Top line of light duty geared head engine lathes (10", 12½", 15", and 18" swing sizes) offers many "high price" lathe features at truly low cost: 12 spindle speeds, selected by color-coded dial; 48 thread and feed changes; exceptionally large spindles; anti-friction bearings, double-walled apron; totally enclosed quick change gear box; many others. Distance between centers from 18" to 60".

All This – And Gap, Too: 15" and 18" Tray-Tops furnished with gap, give you 22" and 25" swings over gap. Carriage has short wings on headstock end for maximum approach of tool; wings on tailstock are extended for maximum rigidity and adequate bearing surface on bed. Like regular Tray-Top, distance between centers from 18" to 60", in increments of 6". All furnished with regular lathe attachments and accessories.



Middleweight Champ: In the medium duty class, the Standard line (14", 16", 18" 20", 22", and 24" nominal swings) assures you real all-around utility with exceptionally low initial investment; quickly pays for itself by efficient handling of practically all your turning, boring, and threading operations. 12 spindle speeds; 32 thread and feed changes; distance between centers from 30" to 240".



Gaps In All 6 Sizes – Increase Capacity: With swings over gap from 24½" to 38½", Standard Fixed Gap Bed Cintilathes give you oversize work capacity where cost of heavy lathe is not justified. Versatility and economy are balanced to your requirements.

WRITE FOR BULLETINS: *T-100 on Tray-Tops; T-101 on Tray-Tops with Gap; S-100 on Standards; S-101 on Standards with Gap.*

the best buy in its class

cintilathe

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO

You don't have to Wish for Efficiency

Bearing performance becomes a reality when you use the Norma-Hoffmann "Cartridge" Bearing in your products. This double-row width bearing has 100% greater grease capacity than conventional bearings. The highly efficient seals lock grease in . . . keep dirt out. Carefully factory-packed with Norma-Hoffmann's specially compounded grease assures high antifriction performance for years on end. These are but a few of the reasons why the Norma-Hoffmann "Cartridge" Bearing is *"America's No. 1 Sealed Bearing."*

Norma-Hoffmann

AMERICA'S NO. 1 SEALED BEARING

NORMA-HOFFMANN BEARINGS CORP.
Stamford, Connecticut

Field Offices: New York • Chicago • Cleveland • Detroit
Pittsburgh • Cincinnati • Los Angeles • San Francisco • Dallas
Seattle • Phoenix

Cuts Your Down Time

GETS YOU ROLLING AGAIN SOONER!

Example: Whether on Motors Under 200 hp, as Pictured, or as Big as the 2700 hp Motor that was Rewound and Running Again in Six Days for E. I. Dupont Co. — Service Stands Back of Charleston Electric Supply Co., Charleston, W. Va.

CHARLESTON ELECTRIC is a *typical* Allis-Chalmers Certified Service shop . . . the kind that is located in every major industrial center.

Yes, *you* can cut lost production time to the bone . . . get fast, expert service on motors, transformers and control by calling the authorized A-C Certified Service shop in your area whenever you need help.

A-C Certified Service Shops are hand picked from the best independent shops in industrial areas. Each meets exacting Allis-Chalmers standards for experience, highly skilled workmen, modern equipment and reputation for square dealing. Each uses nothing but factory approved methods and parts.

Ask Your A-C Dealer or Office—Most industrial areas are now served by A-C Certified Service Shops. For expert service — or for *new* motors from ½ to 25,000 hp — see your A-C Authorized Dealer or District Office. A 2615

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks

Sold . . .
Applied . . .
Serviced . . .

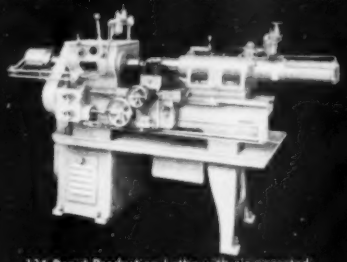
by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

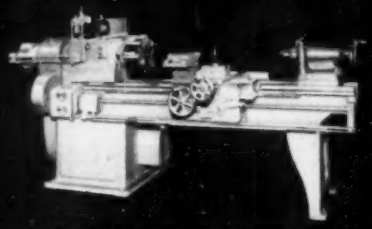
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

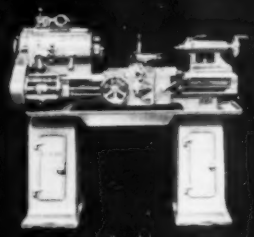
ALLIS-CHALMERS



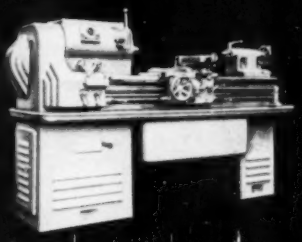
13" Rapid Production Lathe with air-operated headstock and tailstock spindles.



17" Rapid Production Lathe with single speed (2600 rpm) gearless headstock.



13" Regal; also built in 15", 17", 19", 21" and 24" sizes.



Dual Drive with combination gear-belt drive headstock; delivers speeds up to 1800 rpm.

ELECTRIC MOTOR MANUFACTURERS PREFER LeBLOND LATHES

for high speed low cost metal-turning

Electric motor manufacturers rely on LeBlond Rapid Production Lathes for heavy duty turning and for fast chucking and unchucking. These productive lathes can reduce floor-to-floor time on your short-cycle production, too, because they operate at speeds as high as 3600 rpm and can be fitted with efficient, quick-acting chucking devices. Three standard geared head lathes in swing sizes 13", 17" and 20" . . . a 13" Motor Head Rapid Production . . . as well as many special purpose lathes . . . are available to meet your own particular requirements.

The LeBlond Regals and Dual Drives are good shop-mates for the Rapid Production lathes . . . they're excellent for medium duty turning at slightly lower speeds.

for complete information

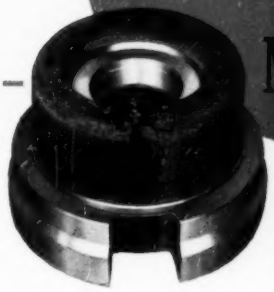
on LeBlond's production-doubling lathes, write for descriptive bulletins: ☐ 13" Rapid Production Lathes ☐ 17" 20" Rapid Production Lathes ☐ Regals 13" thru 24" ☐ Dual Drive

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Philadelphia, Detroit

LeBLOND

Leading manufacturer of construction equipment reports:

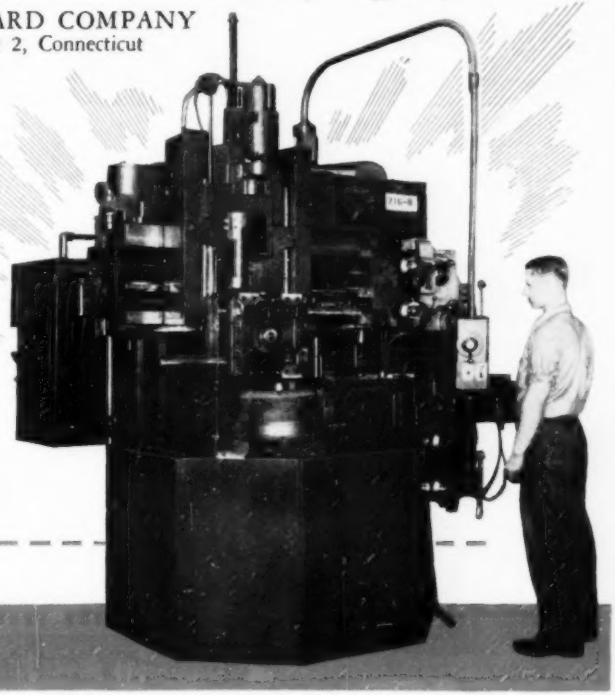
Cast Iron Drive Wheels Machined 5 Times Faster on a BULLARD Man-Au-Trol V.T.L.



Here are shown before and after shots of a cast iron drive wheel for a Motor Grader, machined on a 30" BULLARD Man-Au-Trol Vertical Turret Lathe by Austin-Western Company, Aurora, Illinois. The former method, employing *two machines*, took *1-9/10 hours*. On the BULLARD Man-Au-Trol V.T.L., *actual cutting time was reduced to 20 minutes . . .* a time saving of 82.4%

No other machine offers such a cost-lowering combination of productivity, versatility and accuracy as a *BULLARD* Man-Au-Trol Vertical Turret Lathe. Bulletin MAV-G-4 tells you why. Write for your copy today.

THE BULLARD COMPANY
Bridgeport 2, Connecticut



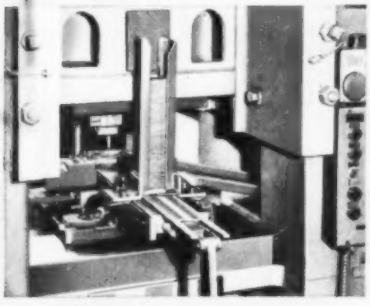
BULLARD

HOW 2600 PIECES PER HOUR ARE COMPLETED

on a DANLY 100-Ton PRESS

¼" Thick Bar Pierced and Shaved in one operation.

Danly 1-Point 100-Ton Eccentric Geared Press at Chain Belt Co., Milwaukee, handling punching operations automatically.



Close-up showing magazine feed

JOB FACTS

Part Name: Offset side bar for transmission chain.

Material: AISI 1335.

Dimensions: Length 3.706", Width 1 5/8" to 1 7/8", Thickness ¼".

Job: Punch two holes of approximately 9/16" and 3/8". Hold precision tolerances on hole sizes and centers.

Rate of Operation: 45 strokes per minute. Net production 2,600 pieces per hour.

Equipped with Magazine Feed

Here's how a Danly Straight-Side Press equipped with an automatic magazine feed and spring-loaded ejector cuts stamping costs by eliminating slow, hand-feeding operations. With unusual speed and precision, two holes are punched and shaved simultaneously in ¼" AISI 1335 stock. A two-step punch eliminates secondary operations. The pieces, which have been blanked and formed in a preceding operation are fed, positioned, and ejected automatically by means of a link and slide mechanism operated by an eccentric on the end of the main shaft. Operated continuously at a speed of 45 strokes per minute, a part is completed and ejected with each stroke of the press. A net production rate of 2,600 pieces per hour is attained.

Precision Tolerances Maintained

Because of the extra rigid Danly press construction including a solid-type bed, deflections are reduced to a minimum and precision tolerances maintained. Likewise, the accurate-operating Danly press slide and a 2-post Danly Precision Die Set help maintain an unusually close tolerance on the hole centers. The result is higher production and better quality at less cost.

Other Important Danly Features

Other Danly press features which contribute to high production efficiency and lower stamping costs include:

- **Built-In Automatic Oiling System**—puts right amount of clean, filtered oil where needed, *including flywheel bearings.*
- **New Floating Friction Block Clutch**—air cooled and air operated—performance tests show 8 million consecutive engagements with negligible wear.
- **Pitman Wrist-Pin Design**—assures closer operating tolerances—longer die life.
- **Extra Sturdy Welded Steel Frame**—All weldments stress-relieved before machining—assures permanent alignment—permits adapting standard or special stock handling equipment to suit needs.
- **Wide Range of Standard Press Sizes**—High production sizes from 50 to 800 tons. Straight-Side units up to 3,000 tons.

Write today for more facts on DANLY PRESSES

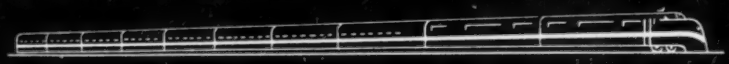
DANLY

DANLY MACHINE SPECIALTIES, INC.

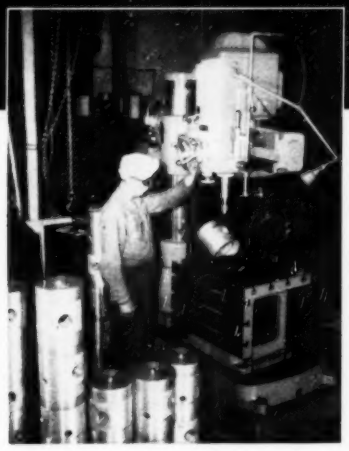
2200 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

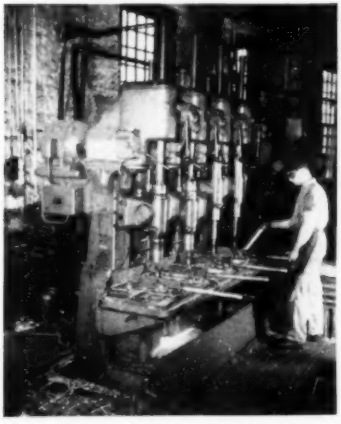
PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT



Important in the *Railroad Shop*



Drilling oil hole in aluminum piston.



Gang drilling a $\frac{1}{8}$" hole in mild steel push rod.

PHOTOS—COURTESY BURLINGTON R. R.

Versatile and speedy Cincinnati Bickford Super Service Radial and Upright Drills, using Hi-Speed tools ranging up to $1\frac{9}{16}$", are doing many jobs in railroad shops—such jobs as drilling brake levers, coupler draft keys, coupler yokes.

The handiness of these machines, their ample power for hogging out metal, clean performance and ease of operation are outstanding.

Write for . . .

Booklet R-21-B on 9" Diameter Column Super Service Radials; also Booklet U-25 on Super Service Upright Drills.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

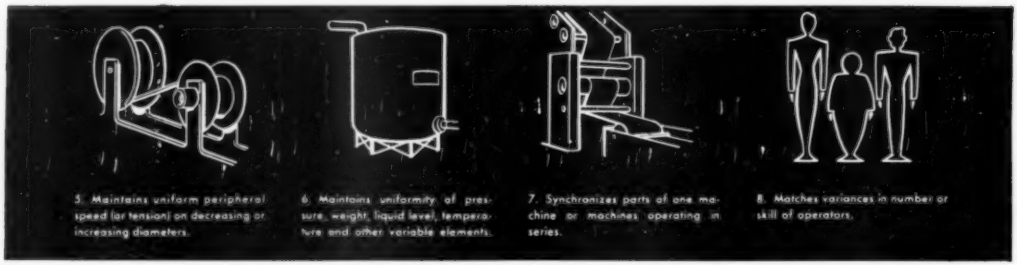
8 Ways Reeves Speed Control Increases Production–Improves Quality

1. Widens the work range of machines to handle more shapes, sizes, materials.

2. Accurately controls heating, baking, drying, cooking or chilling time.

3. Compensates for changes in consistency, density or viscosity of materials in process.

4. Regulates conveyor speeds—even to fractions of an inch per minute.



5. Maintains uniform peripheral speed (or tension) on decreasing or increasing diameters.

6. Maintains uniformity of pressure, weight, liquid level, temperature and other variable elements.

7. Synchronizes parts of one machine or machines operating in series.

8. Matches variances in number or skill of operators.

Here's the tested and proved way to get instant, stepless speed adjustability on your machines—assuring exactly the right speed for every job, under every changing condition.

REEVES Speed Control is standard equipment on more than 2,100 different makes of machines and is easily applied to your existing machines. Units are available in the widest variety of types, sizes, capacities and speed ratios with manual, push button or automatic control.

It's the positive answer to improved quality, higher production and lower manufacturing cost. Our experienced Speed Control Engineers will be glad to help solve your problems. Write today for the new 114-page catalog A-450A.

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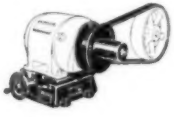
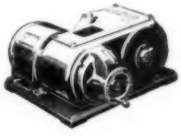
THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 15 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.



SPOT NEWS OF METALWORKING

Kirksite dies are being used by some automobi e companies for small runs of replacement parts. Reason: the practice has been to scrap many small sheet metal forming dies, for tax purposes, after car models have become obsolete and after a normal parts stock has been accumulated. These stocks lately have been depleted faster than anticipated, making further short runs necessary. Kirksite dies are cheapest way of doing the job.

Trend in scrap: many steel companies no longer are requiring their main customers to return their scrap to them. Also, one of the big steel users is offering surplus scrap without takers at current market prices.

Group of top production officials of Vauxhall, General Motors British plant, is revamping manufacturing technique based on U.S. practices, following a five-weeks' stay in Detroit.

Army Ordnance has adopted a new Colt 38 revolver with 2-in. barrel for non-uniformed personnel. Small orders are being placed, pending development of a new light-weight pistol.

Two German hydraulic presses, one rated at 7000 tons and the other at 15,000 tons, are to be installed in the Adrian, Mich., pilot plant of the Army Air Forces. Equipment in this plant is intended to develop ideas on heavy metals, light metals, plastics, ceramics, laminated materials and other materials where high pressures are needed. After new developments have been perfected, private industry will put them into production.

A one-pound synchro motor, with twice the accuracy of previous five- and ten-pound models, has been perfected by Army Ordnance. The new unit operates on 400 or 60 cycles, with the same frame in either case. Synchro motors transmit angular position data from one point to another in fire control mechanisms. They have many mechanical applications.

One engine manufacturer who has been operating a foundry to be on the safe side during the period of castings shortage has sold it. The company believes that from now on it can buy outside all the castings it will require.

A union welfare fund supported by employer contributions and operated by the union is legal under the Taft-Hartley Law, according to ruling in Federal District Court in Philadelphia. Employer contended that the fund did not meet the "trust fund" requirements of the law because he was not represented on the governing board.

Reaffiliation of International Association of Machinists with AFL has been postponed until May meeting of latter's executive council. By then the IAM will have elected a successor to Harvey W. Brown, who is retiring on a $300 monthly pension June 30.

Twenty Danish production men arrived in New York Feb. 10 to study U.S. methods of ship-building, steel-making and machinery manufacturing. They especially want to see new machinery that they don't have in Denmark. They will divide into five-man teams here.

Closed shop will be authorized and non-emergency injunctions knocked out in new labor law, according to expert Washington opinion. Other anticipated provisions: foremen will be permitted to bargain; union treasuries will be allowed to make political contributions.

Gaging Metalworking

Metalworking operations are not at quite the level they were, but still show plenty of underlying strength. Backlogs have been pared down closer to a prewar basis; and vigorous selling has been resumed as competition for existing business once again asserts itself.

▸ The automobile industry is going full blast. So is the railroad equipment industry, and a number of other capital-goods industries. But softness exists here and there, especially in some consumer goods lines. It is believed that production will gain as spring season comes on.

Machine Tool Upsweep

The machine tool industry opened 1949 with a month's business which is believed to have surpassed that in December. New orders during December, in turn, were up from the November total; and November ran well ahead of October. This upward sweep the past three months is most encouraging.

▸ It is true that the improvement is poorly distributed throughout the industry. But most of the builders who did not do as well in January as in December report only a slight decline. January business got its main support from domestic customers; and orders came from a wide variety of user industries, not merely from a few big companies. That fact gives a healthy tone to the current situation.

▸ Sales originating in ECA countries still are not up to expectations. Some few orders, however, are being placed for Western Europe, coming chiefly from Norway, Denmark and Holland. The bulk of the orders ear-marked in France for U.S. machine tool builders has not yet been awarded, but should break soon.

No Great Aircraft Shortages

The military does not expect critical shortages of raw materials for aircraft production this year. But there will be times when fast thinking and even faster footwork by expediters will be in order.

▸ Problem will be one of scheduling. To this end, the Air Materiel Command at Wright Field has created a materials scheduling committee to aid manufacturers in maintaining an even flow of materials into their plants.

▸ Munitions Board budgeteers figure that up to $1 billion can be added to the Presidential budget appropriations for planes without causing undue materials troubles. Few people in Washington think that much over $800,000 will be added to the military budget and designated for planes.

Critical Materials Vary

A quick look at the critical materials affecting aircraft output reveals: (1) contrary to popular conception, aluminum sheet will not be a shortage problem. Extrusions, on the other hand, will be short, but not critically. Main task is to see that any one contractor does not accumulate too much inventory at the expense of another.

(2) Magnesium, though being used increasingly in military planes, is not short enough to curtail production.

(3) High-temperature steel alloys will be fairly hard to get, mainly because the steel industry will be loath to make the small quantities for plane operations. Also, some alloying elements, mainly cobalt and columbium, are very short and hard to come by.

Both the general economic outlook for the metalworking industry and the pick-up that can be expected as winter ends heavily discount the forecasts of those who see recession ahead.

Here are the facts: In January Census Bureau reported 2.6-million unemployed—about 700,000 more than in December. But reports on claims for unemployment compensation show a levelling off of the jobless rise even as January closed.

▸ Though unemployment nears its postwar peak, and may actually reach a new peak in February, most of the rise has been seasonal—winter always sees an upturn in jobless as farming, construction, and post-Christmas retail sales fall off. February is normally the worst month of the year—but in New York City employment was rising early in February.

Business is now feeling effects of heavy collections. December 15-March 15 tax collections bring the government about 48% of the entire year's income tax revenues. That's enough to slow up business, and is reflected even in production indexes. It may also explain the drop in commodity prices, as traders sell holdings to get cash for taxes.

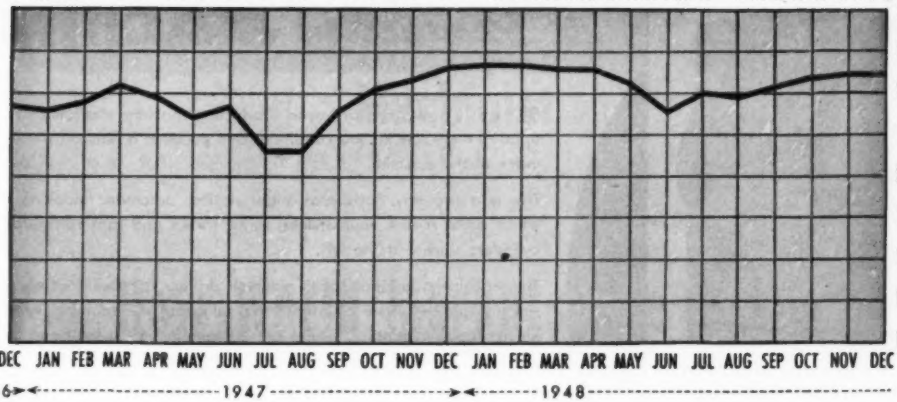
▸ But this situation will reverse itself soon after March 15. Last year's tax cut will mean heavier tax refunds. Withholding tax deductions were not reduced until mid-year, so tax payers will get refunds on payments made earlier in the year.

▸ More important to business will be the expected rise in government cash outlays. Federal cash spending should rise by six to eight billion dollars. Here's the breakdown: $2-billion for defense program; $2-billion — or more—to veterans as insurance dividends; almost another billion added to cost of "social welfare" programs in housing, education, social security; still other increases from enlarged public works and from still-rising foreign aid expenditures. In addition, state and local governments are expected to increase spending by $2-billion or more.

▸ The upswing in the economy from this increased government spending is hard to estimate—particularly before Congress acts—but it will be important. Metalworking, along with other lines will feel its impact. Tax increases may partially offset the climb, but Congress seems unlikely to increase taxes much.

So weighing all the facts, AMERICAN MACHINIST'S earlier belief that 1949 will be a big year for metalworking still holds good.

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG	AUTOS, TRUCKS	TRANSPORTATION EQUIP.	OTHER METAL-WORKING
Dec. 1948	224	249	235	225	309	156
Nov. 1948	224	250	236	223	311	159
Dec. 1947	226	247	245	235	293	156

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

(4) Lead will be the most troublesome of the nonferrous metals. It is tight all over the world; and there may be spot shortages of it in such items as sheathed cable, shields or ballasted products.

Electronics Troubles Expected

The military is anticipating difficulties in electronic equipment. Reason: technology and development from accepted prototypes will not keep pace with plane production. The same situation is likely to develop in jet engine manufacture, mainly due to insufficient production lines. Some new capacity is now being created, however, and it will be a close race from now on.

Tool and Die Work Scarce

Tool and die manufacturers say that work in January was more scarce than in the late months of 1948. The fact is that the contract shop industry ended last year having done 102 percent of the 1947 volume. Invoiced sales in December turned out highest since March.

▶ The lush December, as a matter of record, probably is responsible for some of the falling off since then. Some shops are soliciting and accepting work at prices below the normal rate and only to keep shops open and hold their men.

ECA May Stimulate Business

Backlogs of tool and die shops are down to approximately one and one-half months. While that fact spells fine service for the customers, it is cause for stomach ulcers for the average shop owner, who has to schedule his operations almost from day to day.

▶ Indications are that ECA work may stimulate some business soon. Moreover, rearmament is responsible for the placing of some work. New tooling and dies for many home appliance manufacturers also are in the offing. New England shops, which complained of slackness during the fourth quarter of 1948, are getting some business now.

Steel Bar Stock Low

Forging shops are doing all right. Their backlogs are holding at a higher level than in most industries. Any slackening in demand from the automotive and motor truck industries has been more than offset by business from other sources, such as road-building equipment makers and railroads.

▶ An adequate supply of steel bar stock is the biggest production problem facing the forging industry. The problem is not as acute as it was a year ago; but bar stock still is not available in the desired quantities.

Gray Iron Foundries Down

No big downward slide is reported among gray iron founders. Nevertheless, a definite spotty downward trend is discernible. Many gray iron foundries now are on a four-day week. What is more, the mortality rate among war-born and other comparatively new foundries continues high.

The foundries which are doing the business today are mostly those with modernized equipment and with extended scope of operations to do alloy casting as well as straight gray iron casting.

▶ Current orders on hand are the lowest since December, 1946, but that means little since the backlog is off only 20 percent from the peak of 3 million tons in January two years ago. Materials are in plentiful supply. More and more foundries are reported equipping themselves with full-scale laboratories to enable them to handle all types of iron and alloy castings.

Here's a sample of the kind of work handled on

MORRIS MOR-SPEED *Production* MACHINES

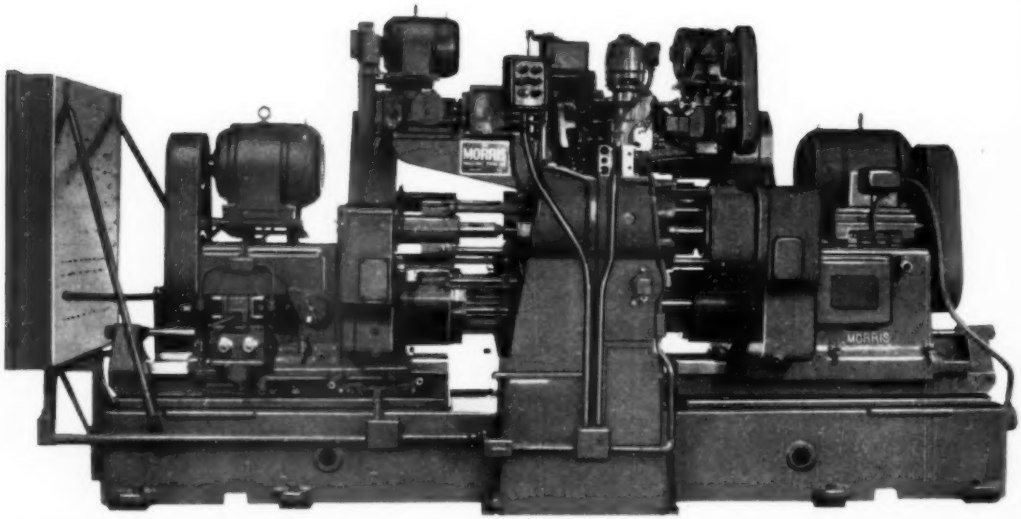
● Here is a Morris Mor-Speed Production Machine designed and developed to meet specific job conditions and produce a finished piece at each index of the machine.

This is a two-way horizontal, eight station, automatic indexing machine which drills, reams, countersinks, forms radius and taps refrigeration unit cylinders shown at the left.

The machine is equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. There are 20 spindles in the left-hand head and 18 in the right-hand head.

If your work calls for numerous operations of this nature on a mass production basis, consult Morris, they have the engineering experience and organization to help you.

The following operations are performed on the work piece shown . . . drill, countersink and tap 8,-¼"-28 tap holes . . . Drill, ream and chamfer both ends of 1⅛" hole . . . counterbore for ⅝" dia. segment . . . drill 2,-13/32 holes . . . counterbore 2⅝" holes . . . drill, countersink and tap 1,-8-32 tap hole . . . drill, countersink and tap 2,-⅜-24 tap holes. Production—150 pieces per hour at 80% efficiency.



Builders of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How World Markets Are Built

General Motors is just opening a new manufacturing operation in Australia able to build 20,000 automobiles a year. Its Australian company has on hand orders for 17,000 cars from Australian buyers. The filling of these orders is so urgent that the company will have little chance to export any cars for the first year.

This development, mind you, has taken place in a country with a population of only 7 million people. It promises to be one of the most highly integrated operations in the automobile industry anywhere in the world. That is mainly because it is in the midst of a market with substantial buying power.

Contrast that situation with India. General Motors would not consider putting a plant of similar size within the vast domain of India with its 295 millions of people. The simple reason is that the Indian masses are so impoverished that they cannot afford to own automobiles. The same condition exists in many other parts of the globe.

This day-and-night contrast in individual wealth between the sparse population of Australia and the hundreds of millions of people in India vividly illustrates what takes place when one area of the world is developed industrially and another remains undeveloped.

It is the sort of thing which challenges American industrial ingenuity and imagination. It is the sort of thing that President Truman was referring to in his inaugural address when he emphasized the need for our helping the rest of the world with our "know-how" and our industrial equipment.

America leads in technology, in the use of mechanical power in producing goods. The visible result is the highest material standard of living in the world.

Britain is trying to find out more about our technology and to apply its techniques. Other countries, both war-depleted areas and undeveloped regions, are seeking our counsel and help. It is true in Latin America, in Africa, in Europe, in the far corners of the earth.

What an opportunity for us to do a superb and sorely needed job of supplying the technical brains and the machinery which will aid the world in becoming industrialized. Much better to do that than to drain our resources by furnishing the expendable materials from our own shores.

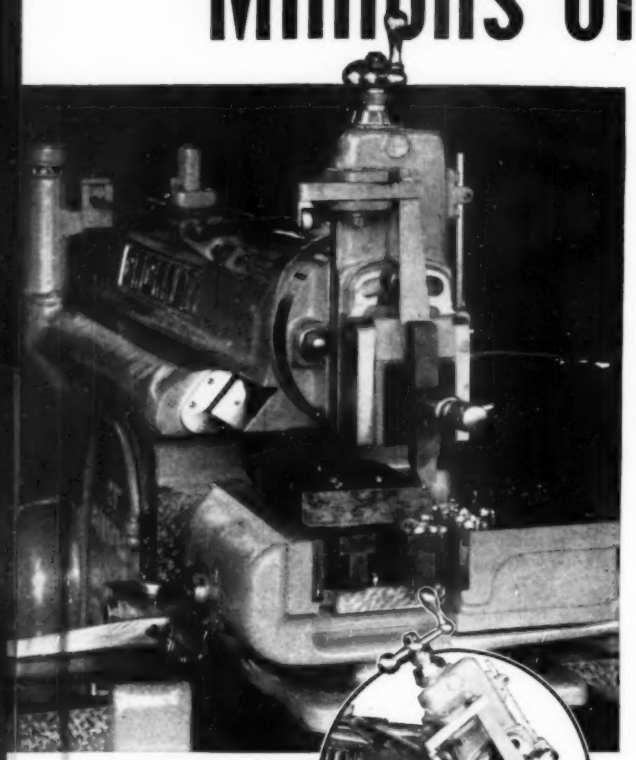
And let's not forget that the bulwark of our export trade is the demand from highly industrialized countries, not from the so-called backward areas. The more the world is industrialized, the bigger will be our market for goods.

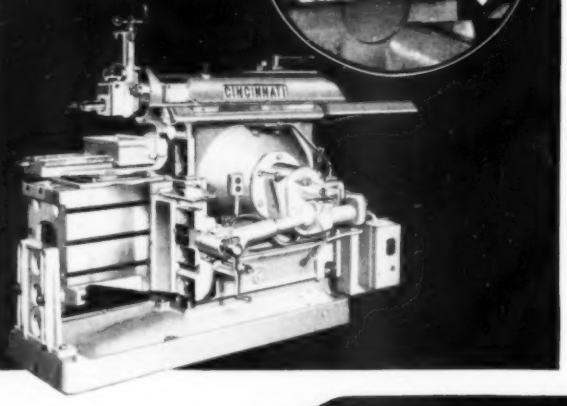
The President's proposed program of exporting know-how and industrial goods to war-depleted and non-industrialized countries has major significance for the capital goods industries. We hope that the leaders of these industries will accept the President's challenge and take full advantage of the opportunity which is theirs.

Burnham Finney

EDITOR

Millions of cuts . . .





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DURABLE

The Cincinnati Tool Lifter, a new development, operates millions of times without a fault. A successful tool lifter must be certain in action on each stroke to prevent tool damage. It must *continue* to be certain month after month, year after year, for millions of operations. The Cincinnati Tool Lifter, with positive return as well as positive lift, is outstandingly successful.

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Efficient at high speeds or low, long strokes or short—dependable at different positions or angular settings of tool slide—or clapper box, the Cincinnati Tool Lifter is truly versatile and productive.

AUTOMATIC

It relieves operators and greatly increases speed of cutting. After simple setting it is automatic.

SPEEDY

Carbide and high-speed cutting tools both operate to greater advantage when protected by a Cincinnati Tool Lifter.

Write for Catalog N-3.

THE CINCINNATI SHAPER CO.

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SHAPERS · SHEARS · BRAKES

Compressor Rotor—78 equidistant ball-root (keyhole) slots must be cut in the periphery of this typical steel rotor (9th and 10th stage). Three broaching steps are required. The first broach cuts a plain slot 9/32 in. deep. The second (semi-finishing) cut is made by a narrower broach to a depth of 9/16 in. The finish broach trues the 0.118-in. slot walls and forms the 0.283-in. dia. at the base to ±0.0005-in. tolerance. Machining time is 2½ hr., at cutting speeds of 20 fpm., and the fixture handles rotors of various diameters

'Unmachinable' Turbo-Jet Parts Broached

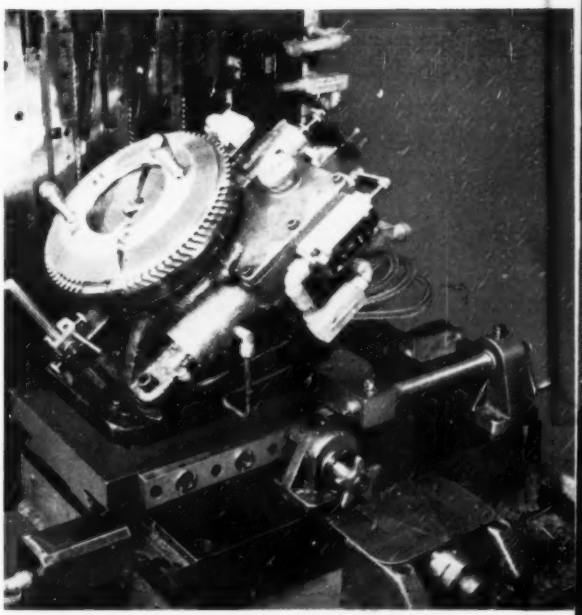
Heavy machines and fixtures, with careful tooling, make it possible to produce complex shapes on blade roots and in rotors and stators

BY OLIVER W. BONNAFE
Chief Research Engineer, The LaPointe Machine Tool Co.
Member, Technical Advisory Committee on Machining of Metals for Jet Engines

DEMANDS for ever-greater horsepowers to obtain superstatic speeds in aircraft have resulted in increasing emphasis on turbo-jet engines — a combination of gas turbine and jet propulsion. Such engines have lower weight per horsepower than reciprocating engines in larger sizes, and can maintain their efficiency at high altitudes where propeller efficiency falls rapidly as air density lessens.

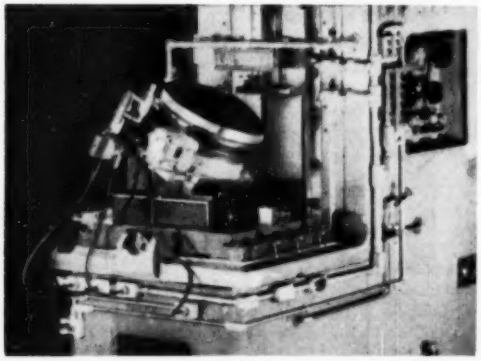
Turbo-jets have many more parts than reciprocating engines, but they are simpler in design and assembly. The engine has three principal parts: a compressor (centrifugal or axial-flow), a combustion section (made up of air tubes, fuel venturis and a distributing diaphragm), and the turbine section. The main problem is to compress air to create terrific pressures, inject that air with fuel through atomizers, and burn the fuel to create greater pressure. Burning the fuel creates power through a turbine to operate the compressor and also increases thrust.

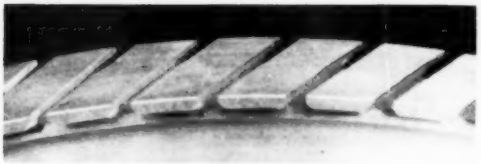
The axial-flow or reaction compressor, with more than 2000 blades and vanes, is the most complicated element in the turbo-jet. It may be replaced by a centrifugal type of compressor,



Rotor Fixture—A 15-ton, 66-in. stroke, LaPointe vertical broach is tooled with three rows of broach inserts and an automatic fixture tilted to 35°. Rotary indexing is automatic, by hydraulic cylinder coupled into the machine circuit. Limit switches prevent stroke until indexing is complete. On the third cut, the fixture is moved away before the broach rises. The fixture can be indexed sidewise manually on base dovetail ways, and located by pins, to align with each broach in turn. A cover plate holds the work and eases handling. In the fixture in this case is a dummy rotor for setup

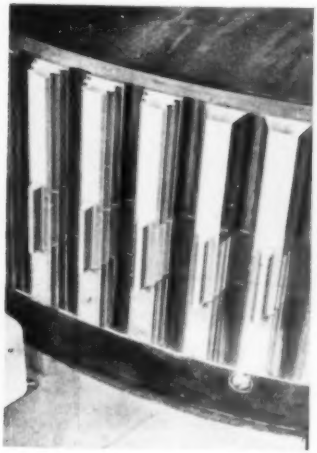
A Larger Rotor—This rotor has 80-odd dovetail slots and is broached in a 15-ton single-ram machine with 90-in. stroke. The automatic fixture, adjustable for disk size and slot angle, moves away after the broach completes a pass to clear the tool on the return to index. Broaching takes 45 min. per piece

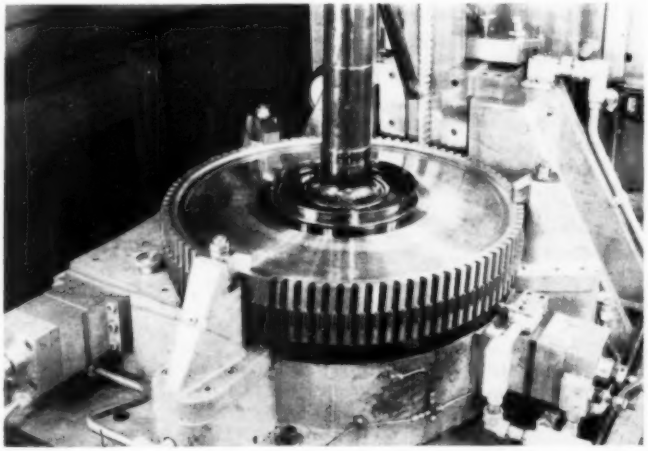




which includes a large rotor that is usually a magnesium forging. In the reaction unit, the rotor and stator are low-specification stainless steel or aluminum alloy, with blades and vanes of 18-8 class stainless. The turbine is composed of a dozen or more disks and stator rings of Inconel, Timken alloy or other high-density alloy. Disks each have about 60 buckets and stator rings about 80, of Inconel or high-cobalt alloys. Fuel, air and exhaust ducts, electrical starting equipment and central driveshaft present no great machining problems, but the turbine and compressor sections offer major difficulties.

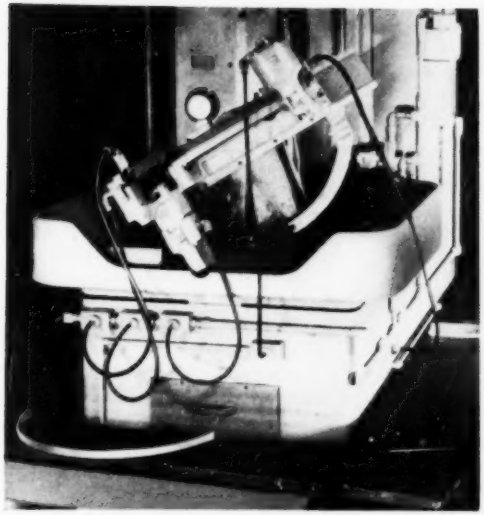
Not only are great accuracies required (particularly in the turbine disks), but also materials are generally classed as "unmachinable." Original materials were Vitallium (a dental alloy), Stellite and J-metal. To these have been added high-nickel, high-chrome types, all hard and tough for heat resistance. Early machining was done by grinding only, but now other processes have been applied including milling, drilling and broaching. LaPointe has been particularly active in application of the latter process and has developed the majority of the broaching



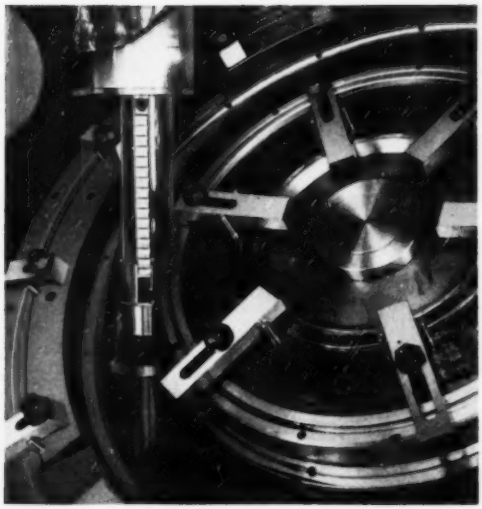


Turbine Disk—A special 15-ton, 90-in., vertical machine broaches the pinetree form in two passes, the first cutting the V, the second the form. Here again the fixture holds the rotor at an angle and indexing is automatic. Hydraulic hold-downs lock the rotor for each pass, and the whole fixture moves back to clear the broach for the return. Note detail of form in closeup at left, with first-pass V-shape at right-hand edge

• RINGS AND SHROUDS . . .

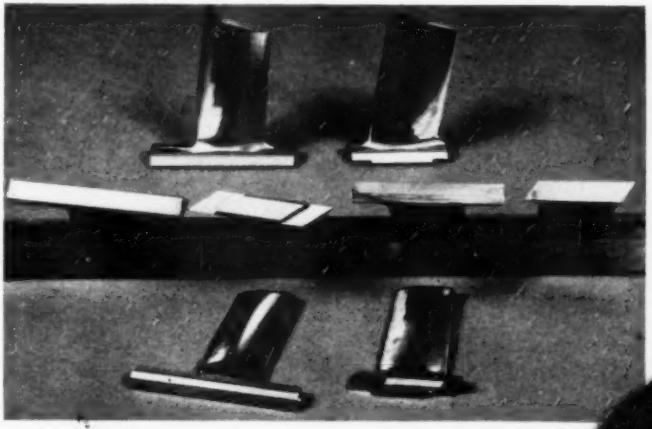


Stator Rings—For ease of installation, the rings which hold the outer blades or vanes are made up of two semicircular segments, each slotted on its inner periphery. In this case, on a 10-ton, 54-in. machine, the protractor fixture is adjustable on its pivots to handle any tilt from 0 to 48°, and indexing is also adjustable (by change gears) to suit number of slots in 12 different segments. The broach must pass within the fixture to cut the dovetail, then move away from the stator segment to clear the tool for retraction and the segment for indexing. Indexing is automatic and safety stops are provided



Inner and Outer Shroud—This fixture handles both rings at once in a 15-ton, 66-in.-stroke vertical broach. It is actually two entirely separate index tables geared together so the rings stay in perfect alignment. Broach rotates 90° to clear pieces for indexing. Work is not shown

• BLADES AND BUCKETS . . .



Typical Blades—This group shows four sets of blades, one of each set root-end cutting and the other showing angular end and step cuts, in e completed in a single pass of the broach. Fixture jaws are interchang handle as many as 26 different types of cuts for various-sized blades pressor blades are 36-40 Rockwell C 18-8 class stainless or equivale materials, handled at 20 fpm. Buckets of Inconel are machined at 25- of high-cobalt alloys at 12 fpm.

fixtures and tools thus far applied.

The major requirement for the broaching machine is that it be extremely sturdy. The characteristic toughness of heat-resistant materials makes it necessary to cut a chip with every tooth — any burnishing action rapidly abrades tool teeth—so the broach must not permit deflection of tool or fixture. In most cases, vertical machines have been selected to minimize floor space, equipped with heavy and elaborate fixtures. On rings and wheels, fixtures are normally automatic or semi-automatic, completing all blade slots in one cycle. Fixtures for blades are of three general types:

1. **Blades cast in holders**—seldom used because of the quantities of blades required.
2. **Blades held on centers**—used when the air-foil section has been previously ground to shape. Recent studies indicate the forged or cast "skin" on blades aids heat resistance, and that extremely close blade tolerances may not be necessary, so this method is finding less application.
3. **Blade-root clamps**—now commonest and shown in accompanying photos.

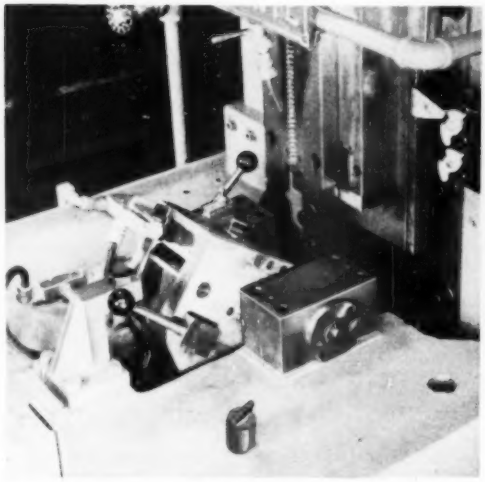
Disks and rotors are usually

forgings turned in the lathe with slots around their periphery into which blades are locked. Stator are similar but made normally in sections. Blade roots have one of three shapes:

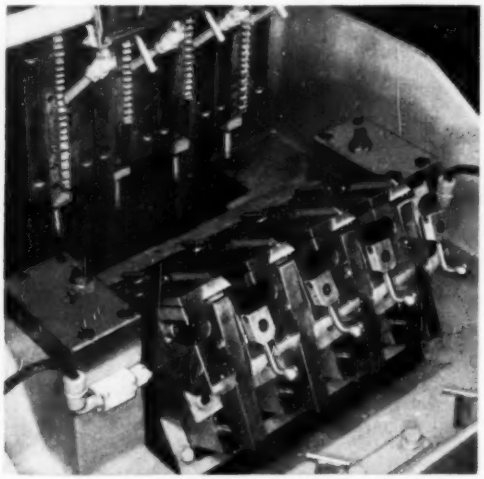
1. **Oval or ball root**—really a keyhole shape (seldom used in turbine section)
2. **Dovetail root** (some compressor sections)
3. **Pinetree root** (most efficient and the commonest, but most difficult to machine).

While conditions vary from job to job, usual practice is to broach 0.0025 to 0.003 from blade roots, taking as little as 0.0002 in. per tooth in the hard materials. Each tooth must cut—any burnishing action promptly ruins tools, because of the abrasiveness of the materials. Coolants are still under development, the best thus far being a carbon tetrachloride solution (10-20%) which requires special hooding because of its toxicity.

Steel rotor wheels are broached in a single pass at 20 fpm.; aluminum-alloy ones are roughed at 40 fpm., then finish-broached at 30 fpm. to avoid distortion. The super-accurate turbine disk, of Inconel or Timken alloy (about 30 Rockwell C, but tough) is roughed at 15 fpm., finished at 10-12 fpm.

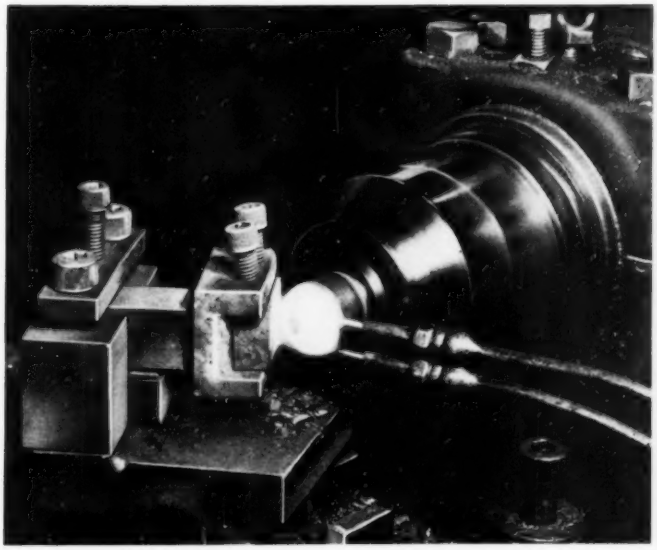


Ball-root Blade—Ball-root blades for the compressor rotor are held in a low-melting-point-alloy matrix in a slotted tubular holder (lower center). These holders are inserted in the workrests in the tilting fixture. The "ball" or cylindrical shape is broached in one pass



Blade Roots—Here is a fixture for four dovetail blades on a single-ram, 15-ton, 66-in. vertical machine. It tilts back hydraulically on a base pivot for loading and can handle 300 pieces per hr. Blades, regardless of contour or length, drop into sockets and are located on the airfoil through the hand cranks on top. Then hydraulically operated descenders clamp the blade for broaching the dovetail. Locating is done by carbide-tipped centers on dovetail slides which enter center holes in the root ends. About 0.060 in. of stock is removed on a side at 25-30 fpm. for Inconel or 12 fpm. for the high-cobalt alloys

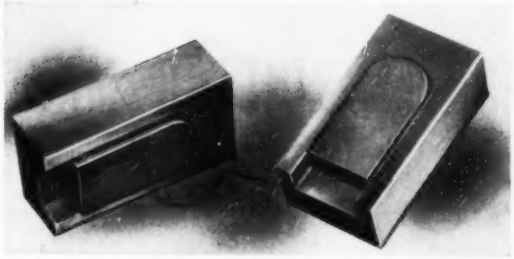
Continuous Broaching—With a double-ram machine, the operator can reload one fixture while the other is being broached, attaining a production of 450 blades per hr. This is a 5-ton, 42-in.-stroke machine which releases fixtures automatically after the broaching stroke. It handles the second operation on dovetail roots—broaching the ends to length at the proper angle and also cutting the relief. Clamping is on the finished dovetail by V-shaped jaws on a hydraulically actuated cam



Typical hand-spinning setup puts ⅝-in. radius on end of 1¼-in., 22-gage steel tube. Two small oxygen-natural gas torches heat the end as the tube is spun at 1000 rpm. by a carbide block in the swiveling toolpost. Production is 280 per hour, and the closed end will withstand 200-psi. hydrostatic pressure without other sealing

Spinning blocks for this operation are Kennametal grade K138A, wedged in dovetail slots in tool-steel holder faces. Previous carbide blocks cracked after 4 to 6 hr.; these last 30 to 32 hr. before regrinding, then can be reground 5 to 8 times. Size and grade of carbide block depends on tube material and size, form to be spun and temperature

CARBIDE BLOCKS SPIN TUBE ENDS



Converted screw machines spin to any radius less than 5 in., close ends or leave desired holes, make noses at any angle or extrude tube

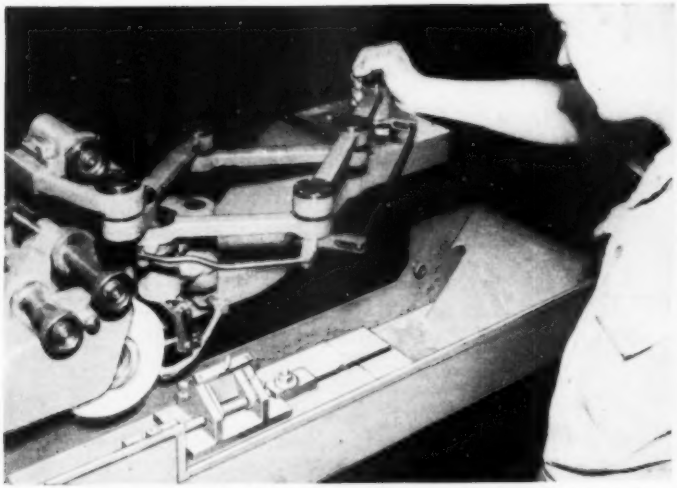
BY H. PEPPERCORN, Engineer, THE ROBINSON TUBE FABRICATING COMPANY

SPECIAL procedures at our plant spin tube ends closed or to holes of required diameter, to radii up to 5 in. or to any nose angle—even "extrude" them to smaller diameter. In most cases, we use converted Warner & Swasey 3 A hand screw machines equipped with special high-temperature spindle bearings and pressure lubrication. Drives are 1- to 3-hp. motors, spindle speeds 600 to 1500 rpm.

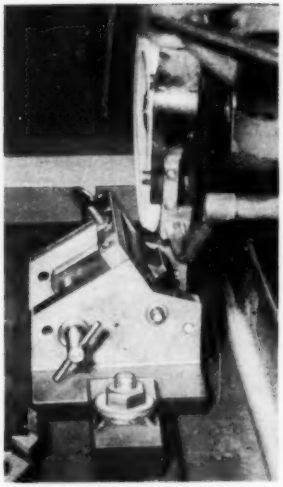
Spinning temperature is 700 to 1350 F., depending on material. We have spun accurate shapes on tubes ranging from SAE 1010 and 1020 to tool steels, as well as Nichrome and nickel. At present, we can spin tubes to 6-in. dia., producing 60 tube ends per hour in 6-in. tube with 5/32-in. wall. Such pieces were previously drop-forged at 15 to 20 per hr. We have also replaced tubular deep-draw stampings with tubing; for example, spinning and one or two punch-press forming operations may replace five or more draws.

Lathes have special swiveling tool rests on which is a heavy holder for the spinning block. The support rest is swung by hand about its pivot in the cross-slide, unless quantity production justifies automatic control of tube temperature, time cycle, rate of swing of the tube block and rapid return after spinning. In the latter case, the operator merely feeds parts into a collet chuck.

Tubes thus formed are used for many products, such as refrigeration and air-pressure tanks, conveyor rollers, plumb bobs, bobbins, refrigerator drier units, thermocouple tubes, nozzles and caps. Possible applications for spun tubing are legion and were not appreciated until World War II developed the process.



Dressing of the form on the wheel is controlled by a Moore Panto-Crush attachment, which has a 10:1 reduction in movement of the carbide templet tracer to the diamond wheel dresser.



Radius, fillet and flat surfaces are all ground at once with the formed wheel to a surface finish of 4 to 6 micro-inches

FORM GRINDING MAKES BETTER LATCHES

Manufacturing use of "toolroom" method produces a 30% time saving, improves quality

By RUPERT LE GRAND
Associate Editor

IN CIRCUIT breakers it is difficult enough to obtain rapid, arc-free action in extremely short time intervals without being plagued by sluggish action of mechanical elements. For this reason, the main latch of the trip mechanism must have several surfaces, a radius, and perhaps a fillet, on the hook section, properly ground and blended. But even though the latch might be considered the heart of the mechanism, until recently the I-T-E Circuit Breaker Company was compelled to grind separately the several related surfaces and a radius, and to do some hand work on the parts. Thus, while each circuit breaker functioned properly when it left the factory, interchangeable latches were not available to simplify assembly and field service. The latter was a problem.

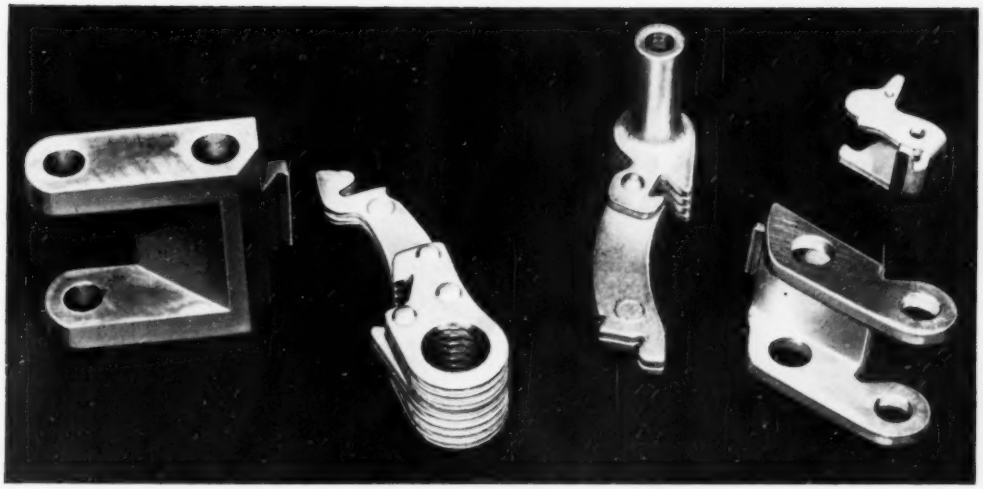
The decision to apply what had been considered a toolroom method of form grinding to manufacture of main latches is a typical example of how I-T-E operates. This medium-size independent manufacturer has for years demonstrated its faith in maintaining a modern shop by spending hundreds of thousands annually for replacement equipment and tooling. Its management says: "Any machine, regardless of age, will be replaced by a more productive one; any process that is unchanged after five years is subject to suspicion." This attitude is remarkable, considering the fact that most of I-T-E's many thousands of operations are conducted on a small-lot rather than a mass-production basis.

No machinery-replacement formula or special practices are used to determine if a new machine will save production time. Executives responsible for production and equipment constantly visit various departments to study operations and processes, and to visualize the potential savings from both a new machine and appropriate tooling. And they encourage vendors to inspect operations and make recommendations.

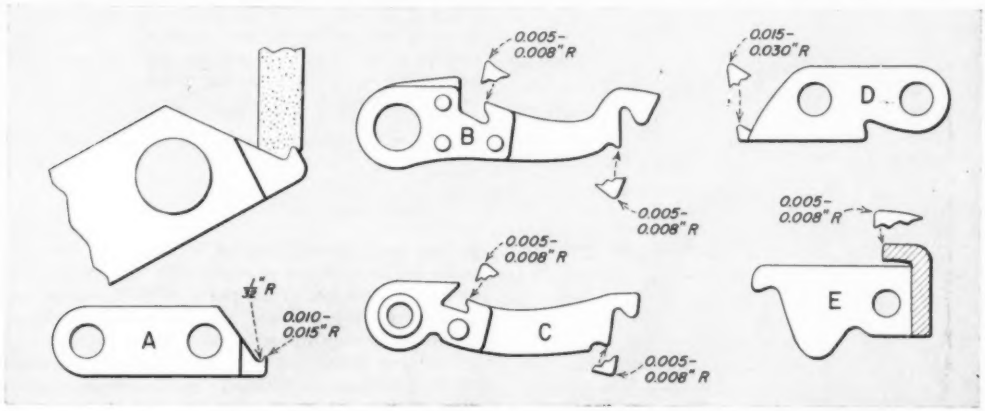
Several Advantages of Method

This policy, in respect to form grinding of main latches, has paid off in an average time saving of 30%, plus product improvement that gives better calibration of circuit breakers and achieves a uniformity in operation never attained previously by hand fitting. Further, the interchangeability of latches, both in assembly and field replacement, has definite advantages.

Form grinding is done on No. 2



Five main latches for various patterns of I-T-E circuit breakers have either one or two "hooks," which must be ground accurately to obtain proper dropout action. These parts are readily identified below



Time savings through form grinding are: part A—32%, Part B—10%; part C—42%, Part D—31% and part E—33%. Further savings in assembly are also obtained because no time is lost with hand fitting in order to get the desired action of the circuit-breaker mechanism

Brown & Sharpe surface grinders equipped with a Moore Panto-Crush attachment. But the wheel is not crush-dressed to form, because it is said that the "grain cannot be split" by such means, and hence the work finish would not be satisfactory. So the wheel is dessed to form with a diamond stylus, whose movements are controlled with a pantograph tracer bearing against an enlarged templet of the work profile. A 10:1 reduction is obtained from the pantograph.

Prior to form grinding, the pivot hole in the main latch is ground on a Bryant grinder to 0.0005 in. or better, to provide a locating surface. During form grinding, the part is held in a simple fixture with a pin passing through the ground pivot hole. And the part is located in the fixture in a position such that all surfaces can be ground without necessity for dressing re-entrant angles on the wheel. With a 100-grit, G-bond wheel, a surface finish of 4 to 6 micro-inches is obtained and wheel wear is satisfactory. This surface quality much improves the smoothness with which the latch disengages from the detent mechanism of the circuit breaker.

Originally, engineers contemplated the installation of five Panto-Crush attachments, in order always to have a setup available for each of the five main latches. But in practice it was found that two attachments would suffice, because the wheels were quickly redressed to the necessary form for a specific latch.

BLANK DIAMETERS FOR DEEP-DRAWN CONES

Mathematics eliminates the guesswork in determining blank size

BY B. SPECTOR

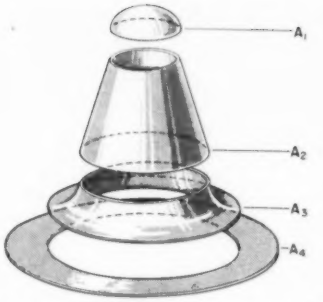


Fig. 1—Deep-drawn cone may be considered to be made up of four sections: a spherical segment, frustum of a cone, a fillet, and a flange

PLANNING of dies for deep drawing cones is based upon two fundamental concepts:

1. The total area of the shell after any operation must equal the total area of the cone (the thickness of the metal must be the same before and after drawing).
2. The shape of the shell after the next to the last operation must be as close to the final shape as possible.

The former concept makes possible an accurate method of computing the diameter of the blank; the latter guides the development of a set of dies.

In determining blank diameter, cut-and-try methods may be replaced by mathematical computations. Because the volume of the blank must equal the volume of the finished work, the cone volume may be equated to the formula for blank volume. This equation may then be solved for the blank diameter:

$$\text{Volume of the blank} = \frac{\pi \ D'_B \ t}{4}$$

where,

D_B = diameter of the blank
t = thickness of the blank

It may be assumed, however, that the dies will be made so the thickness of metal after each draw will equal the thickness of the stock. With this assumption, thickness may be disregarded and the computation based on areas only.

The area of the finished cone may be determined by considering it to be made up of a series of sections, Fig. 1, for which area formulas are available

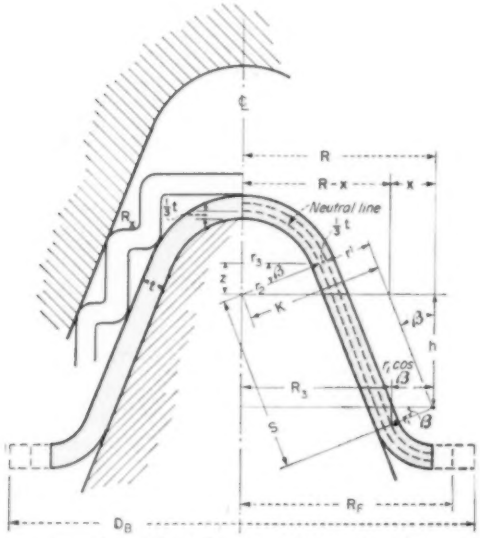


Fig. 2—Scale drawing of cone aids expression of general formulas for determining the area of each section in cone

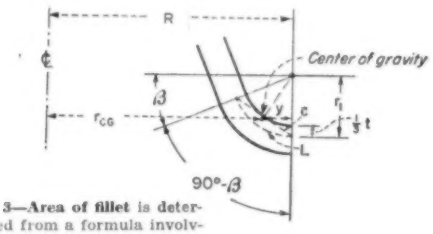


Fig. 3—Area of fillet is determined from a formula involving center of gravity of the circular arc of the fillet

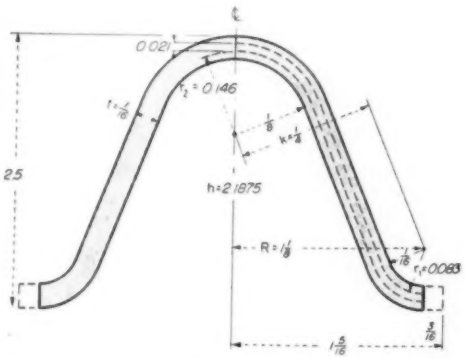


Fig. 4—Dimensioned drawing of cone is necessary to apply formulas to specific problem

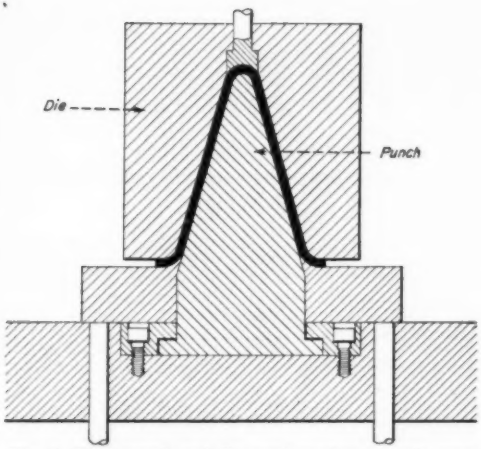


Fig. 5—Final punch and die must produce smooth cone from stepped product of previous drawing operations

or can be developed. Section areas are computed individually and added to give the total area of the cone:

$$Total\ area = A_1 + A_2 + A_3 + A_4$$

where,

A_1 = area of spherical segment
A_2 = area of frustum of cone
A_3 = area of fillet
A_4 = area of flange (even if a flange is not specified, it is useful for trimming)

Referring to Fig. 2:

$$A_1 = 2\pi r_1 (r_1 - Z) \quad (1)$$
$$A_2 = \pi s (R_3 + r_2) \quad (2)$$

where,

$$Z = r_2 \sin\beta \quad (3)$$
$$s = k \tan\beta + h \sec\beta \quad (4)$$
$$R_3 = R - r_1 \cos\beta \quad (5)$$
$$r_2 = r_1 \cos\beta \quad (6)$$

To solve these equations, it is necessary to derive an equation from which the value of β may be computed.

This derivation may be followed by reference to Fig. 2:

$$x = h \tan\beta \quad (7)$$
$$\frac{\sqrt{h^2 + x^2}}{h} = \frac{R - x}{k} \quad (8)$$

Substitute in (8) the value of x from (7),

$$\frac{\sqrt{h^2 + h^2 \tan^2\beta}}{h} = \frac{R - h\tan\beta}{k}$$

Factoring, simplifying, letting $\frac{1}{k} = Q$, and squaring both sides, the equation becomes:

$$1 + \tan^2\beta = Q^2 (R - h\tan\beta)^2$$

which may be reduced to the form of:

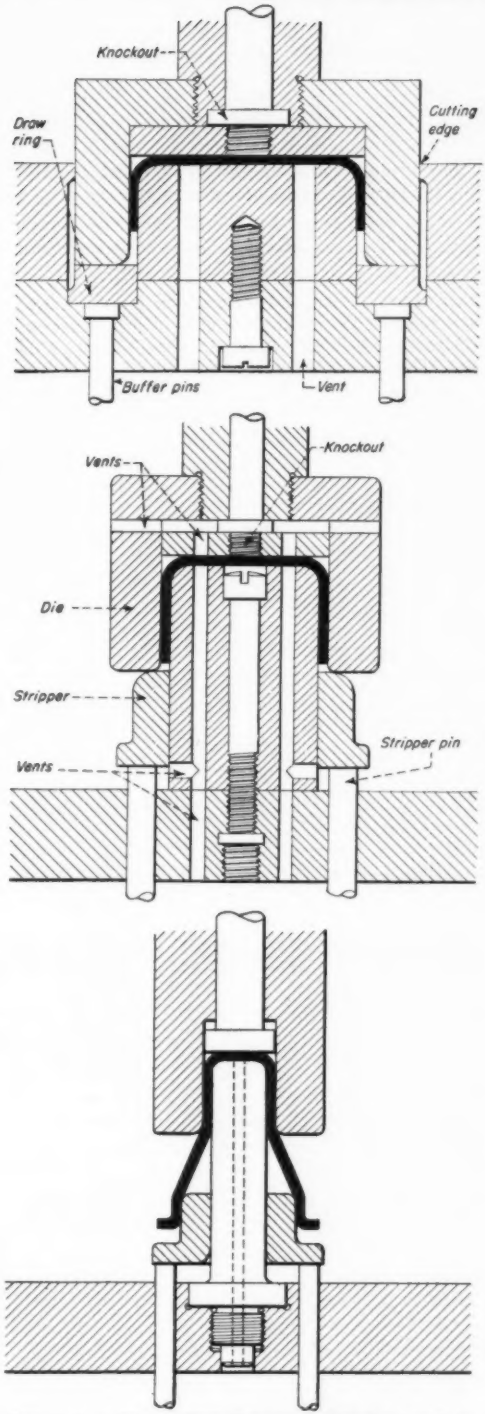
$$O = (Q^2 h^2 - 1)\tan^2\beta + 2Q^2 Rh \tan\beta + Q^2 R^2 - 1$$

This is in the form of the general equation:

$$O = Ay^2 By + C \quad (9)$$

in which:

$$y = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A} \quad (10)$$



Figs. 6, 7, 8—Intermediate dies are designed so radii in stepped shape are as large as practical and some steps are frustums of cones

BLANK DIAMETERS *continued*

and,

$$\left.\begin{aligned} A &= Q' h' - 1 \\ B &= -2\ Q'\ RH \\ C &= Q'\ R' - 1 \end{aligned}\right\} \qquad (11)$$

Substituting values of (11) in (10) and simplifying, the general equation for β is obtained:

$$tan\ \beta = \frac{Q'\ Rh \pm \sqrt{Q'\ (R' + h') - 1}}{Q'\ h' - 1} \qquad (12)$$

The formula for the area of the fillet is derived from the Theorem of Papus, which gives the general formula for finding the area of any developed surface as: $S = LP$, where L is the length of the line being traced on any path P. The line L moves so its center of gravity slides along path P, while the plane of L remains perpendicular to the path.

The area of the fillet, then, may be found by computing the length of the line that, when rotated about the centerline, develops the fillet and by multiplying this length by the length of the path of rotation, $2\ \pi\ r_{cg}$, where r_{cg}, is the distance from the center of rotation to the center of gravity of the circular arc of the line. In Fig. 3, this distance, r_{cg}, is $R - y$. The formula for the area of the fillet then becomes:

$$A_3 = 2\ \pi\ (R - y)\ L \qquad (13)$$

where,

$y = a\ sin,\ ½\ (90° - \beta)$, (14), and a may be computed from the formula for determining the center of gravity of the circular arc.

$$a = \frac{r_1\ c}{L} \qquad (15)$$

where,

$$L = 2\ \pi\ r_1 \left[\frac{90° - \beta}{360}\right] \qquad (16)$$

$$c = 2\ r_1\ sin\ ½\ (90° - \beta) \qquad (17)$$

The fourth section, area of the flange, is determined by the following formulas; refer to Fig. 2:

$$A_4 = \pi\ (R_2' - R^2) \qquad (18)$$

Taking an example, Fig. 4, and solving in (12) for β:

$$K = r_1 + r_3 + \frac{t}{3} = 0.250\ in.$$

$$Q = 1/k = 4\ in.$$

$$tan\ \beta = \frac{16 \times 1.125 \times 2.1875 \pm \sqrt{16(1.265 + 4.74) - 1}}{16 \times 4.74 - 1}$$

$$\beta = 21.5°$$

then, from (1) and (3), $A_1 = 0.085$ sq. in.; from (2) (4) (5) (6), $A_3 = 8.970$ sq. in.; from (13) (14) (15) (16) (17), $A_3 = 0.673$ sq. in.; from (18) or area tables, $A_4 = 1.436$ sq. in.; and total area = 10.964 sq. in. This value is substituted in the equation for blank diameter:

$$\frac{\pi\ D_2'\ t}{4} = 10.964\ \text{sq. in.}$$

$$D_2 = 3.73\ \text{in.}$$

These formulas have been expressed in the general form and are universally applicable to determinations of blank diameter for deep-drawn cones. Cut-and-try methods can thus be avoided.

Considering the development of the dies, a cone is produced from a flat disc by drawing a cylindrical cup of diameter larger than the base of the cone and redrawing until at the next to the last operation a stepped cone, left side of Fig. 2, is obtained. In the last operation, the punch and die will "iron" the stepped cone to the final conical shape. Such a die is shown in Fig. 5.

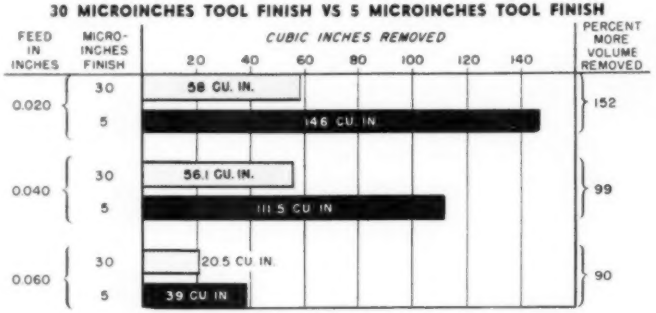
It is evident that the closer the shell approaches a cone, the easier it will be to iron out the steps. This close approach is effected by making the radii, R_2, large and by making some steps frustums of cones. This is accomplished by dies of the type shown in Figs. 6, 7 and 8.

IMPROVED SURFACE FINISH INCREASES TOOL LIFE

BY THOMAS BADGER, Mfg. Engineer, WESTINGHOUSE ELECTRIC CORP.

For many years it has been generally believed that improving the surface finish of a cutting tool was beneficial to the life of the tool only where fine feeds were applied. The thinking behind this supposition was that under extremely heavy cuts the surface finish of the cutting edge was completely ruined by the heavy initial impact, and therefore a highly refined finish was of no advantage.

A number of lathe tools have been tested. For comparison, the tools of one group were carefully ground on a shop pedestal grinder using a freshly dressed wheel. The tools of a second group were ground on a Buraway grinder and lapped on a 220-grit diamond wheel. Cutting speed used in the test was 136 sfm., depth of cut was ⅛ in., work material was 0.45% carbon forging, heat-treated to 210 Brinell hardness. Even with the heavy feed of 0.060 in., tool life was increased 90% by the surface-finish improvement from 30 to 5 microinches.



TALKING SHOP

SAE Hp.?

PEOPLE continue to talk about SAE ratings for automotive engines. There is no such thing. The formula $D^2N/2.5$ (D cylinder diameter in inches, N number of cylinders, and piston speed 1000 fpm.) was developed for taxation purposes by the Royal Automobile Club of England. It was first adopted in the U. S. by a predecessor of the Automobile Manufacturers Assn. The SAE put it in its handbook in the loose-leaf days, clearly credited to sources, but engineers began to use it with the wrong credit.

Chip Maker

SOMETHING LIKE A RECORD is being achieved at General Electric's Erie works, where a specially designed carbide drill is removing 65 cu. in. per min. Specifically, the job consists of drilling a 3½-in. hole 14 in. deep in 40-carbon steel. Water is used at 90 psi. to cool and remove the chips, and holes are true within 0.0005 in. for roundness and taper. Most lathes do not have the power to permit the desired feed rate of 7 ipm., and the job usually has to be slowed down to a 3-min. operation which gives about 45 cu. in. per min.

Wedge Belts

WEDGE BELTS are being used in power transmission for automotive accessories. They have a 36° angle instead of 40 to 45, are ½ to 2/3 the width of the belts they replace, use rayon cords instead of cotton and have three to five times the life of the older belt—or so Cadillac engineers say.

Hammered Down

AT THE HUNTINGTON PLANT of International Nickel, the base for the lower anvil of the largest steam forging hammer, an 8-ton unit, is the usual heavy and deep concrete block. Nevertheless, it is driven into the sandy subsoil at a rate of 6 in. per year. Filling between block and anvil is thus an annual event. Excavation to build a flood wall along one edge of the plant—about a quarter of a mile away—caused enough subsoil shift to more than double the sinking in that year . . . This hammer, being used largely as a blooming mill, is served by a pair of manipulators that cut non-productive time from the old 50% to less than 10% nowadays.

Heat Stealer

A LAYER of aluminum, invisible beneath a new thin plastic table top, conducts heat away so rapidly that the plastic is not burned by those ever-present cigarette butts.

Heavyweight

AN ALLOY roughly 90% tungsten, 6% nickel and 4% copper, developed as a shield against radioactive emanations, is finding use in counterbalance weights because it's 50% heavier than lead. Parts are formed by powder metallurgy.

8 Men Became 3

EIGHT MEN were formerly required in one plant to inspect for and swing-grind out flaws in roughed tube and bars. Each man acted as his own inspector. By having one inspector check and mark the jobs, while grinder men stick to their grinding, the shop has cut grinder men to two, or total labor cost 62½%.

Daffynitions

DRUNKEN DRIVING: putting the quart before the hearse . . . SARCASM: piece of mind . . . JAYWALKERS: bumper crop . . . BIGAMIST: man who rings twice . . . STALEMATE: husband who tells the same old jokes . . . HISTORY: what keeps bygones from being bygones . . . GOLD-DIGGER: a fund-loving gal . . . POLITICIAN: one who talks himself red, white and blue in the face . . . DISAPPEARANCE: when something a big-game hunter disagrees with eats him . . . MATRIMONY: united state . . . BACHELOR: an amour-plated male . . . CONFERENCE: a group of people talking about something they should be doing . . . RED TAPE: the other fellow's system.

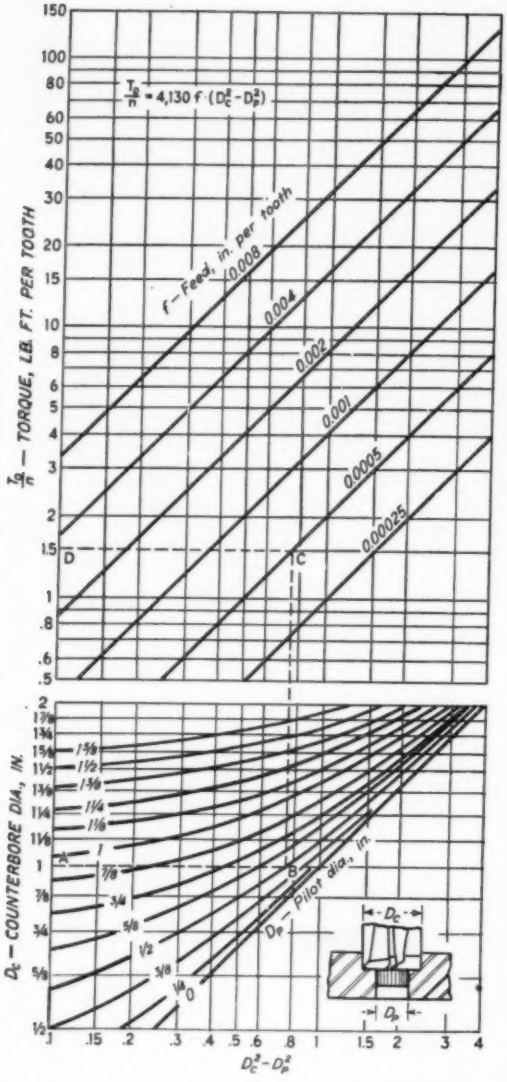
Line of Sighting

REMEMBER the wartime British method of aligning a big aircraft jig with telescope and collimator? Eastman Kodak is busily producing an instrument on the same principle for erection and inspection of long planer ways and beds—because optical devices have no sag like that experienced with the common piano wire and involve no complex calculations like those required when a level is used on an up-bowed bed. Tests indicate the new device will measure deviation in either direction of 0.0001 in. at 20 ft., or 0.002 in. at 115 ft. That's an error of 1/7 sec. of arc, equal to 26 in. deviation in the distance from Cleveland to Chicago.

Another gadget is a telescope that enables a boring-mill operator to read verniers to the thousandth—even though they're 10 ft. away. Still another enables an erector to determine proper shim thickness to position the center one of three widely spaced bearings. Now he takes the right shim from stock, instead of spending 4 hr. cutting and trying.

HOW COUNTERBORES BEHAVE

Torque, thrust, and power for counterboring various materials with carbide-tipped and high-speed-steel tools can be computed for various feeds and speeds



1 Torque *per tooth* is found directly with this chart, when counterboring SAE 1020 (180 Bhn) at 187 sfpm. with carbide-tipped cutters of various diameters and at various feeds. To compute torque for other materials see conversion factors, Tables II and III

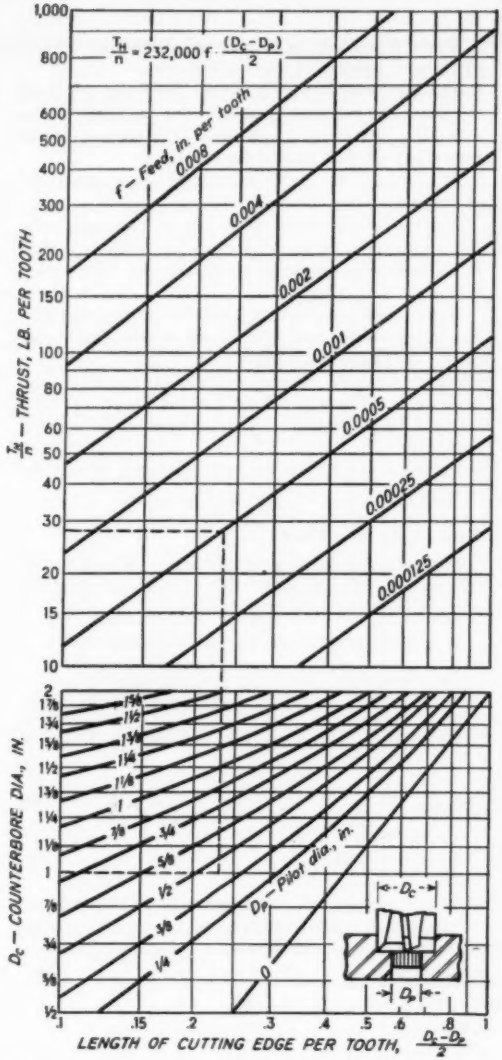
A special torque and thrust dynamometer was developed for the investigation, in order to obtain sufficient accuracy in readings

A report of the Research and Technical Committee, Milling Cutter Division, Metal Cutting Tool Institute

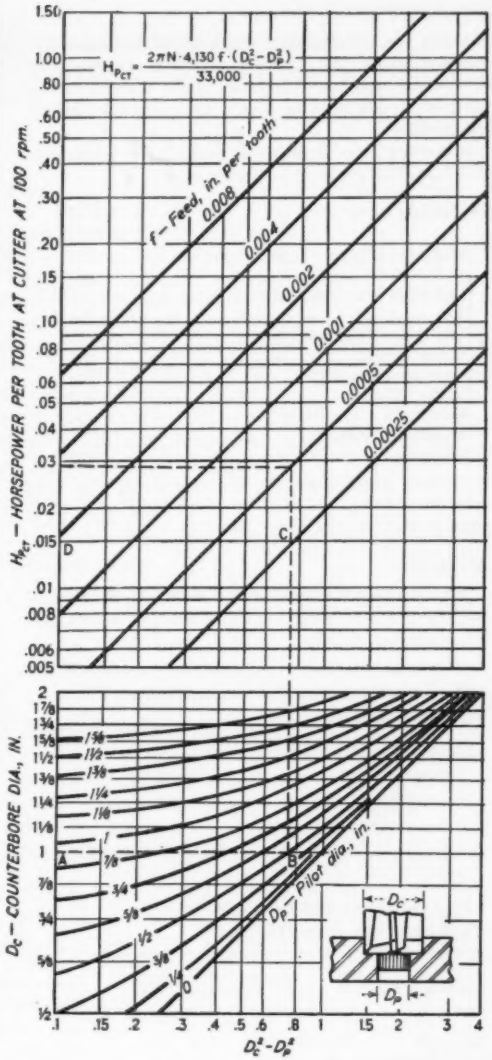
ALTHOUGH counterboring is a common metal-cutting operation, information has been lacking on torque, thrust and power for counterboring various materials under various conditions of feed and speed. For this reason, the Metal Cutting Tool Institute sponsored, through the permanent Research and Technical Committee of its Milling Cutter Division, a comprehensive investigation of the subject.

The purpose of this investigation was to establish data that would be reliable, easily understood and readily applicable to any practical problem of counterboring. This was accomplished, first, by recording data obtained from a series of experimental runs, and, second, by analyzing the data and developing formulas and graphical solutions.

In making the tests, commercial counterbores and pilots were used under controlled conditions. A torque and thrust dynamometer of sufficient capacity



2 Thrust *per tooth* is obtained with the chart, when counterboring SAE 1020 (180 Bhn) with carbide-tipped cutters. Thrust correction factors for other materials are found in Tables II and III



3 Horsepower at the cutter, Hp_{CT} *per tooth*, is found directly with this chart, when counterboring SAE 1020 steel (180 Bhn) with carbide-tipped cutters of various sizes at different feeds but constant cutting speed of 100 rpm. For horsepower at other speeds multiply by the rpm. used and divide by 100. Correction factors for other materials are found in Tables II and III

and rigidity was designed, built and calibrated in the Metal Processing Department of the Department of Engineering Research, University of Michigan. A new design of web diaphragm was made for this dynamometer to have a torque capacity of 140 lb.-ft., thrust capacity of 1000 lb., and a maximum deflection of 0.001 in. Deflections caused by torque and thrust were measured with Pratt & Whitney "Electrolimit" gages built into the dynamometer.

Operating difficulties were encountered when chatter, vibration or chip clogging occurred. These conditions arose at light feeds with a long cutting edge; that is, when a large counterbore diameter and a small pilot diameter were used. Pilot clearance in the pilot hole also influenced chatter, and in several cases the amount of clearance was changed.

No effort was made to obtain life figures or to alter cutter design to help chip disposal, etc. Where chip

clogging caused chipping, breaking or dulling of the cutting edges, the counterbore was replaced or sharpened, and then operated under altered conditions of speeds, feed or depth, to secure the desired information.

Materials used, equipment, cutters and conduct of the investigation may be summarized:

Materials cut:

	Brinell Hardness
SAE 1020 steel, cold-rolled	180
SAE 6150 steel, hot-rolled	195
SAE 6150 steel, heat-treated	241
Tool steel, 1% C., annealed	156
Cast iron, 40,000 psi	210
Monel metal	207
Phosphor bronze	156
Leaded brass	124
Aluminum alloy, 24 ST	154
Aluminum, soft, 2S	36
Magnesium, cast, H alloy	63

All test pieces were 2 in. in diameter by 2 in. long with pilot holes drilled in a turret lathe to nominal pilot sizes of ⅜, ½, 1 in., etc.

Machine:

No. 2K vertical, knee-type Kearney & Trecker milling machine with 7½-hp. motor. Assumed machine efficiency, 80%.

Equipment: The torque and thrust dynamometer described above and a recording wattmeter.

Cutters: The H.S.S. and carbide-tipped counterbores used were of the following sizes:

Tool Diameter	*Pilot Diameter*
1 in.	⅜ and ½ in.
1¼ in.	⅜, ½ and 1 in.
1½ in.	⅝, ⅞ and 1⅛ in.

Radial rake of 0°, axial rake of + 3° and end relief of 8° were applied to all counterbores.

Operating conditions: The speed, feed and depth of cut were limited to stay within the capacity of the available machine power and the chip-disposal properties of the counterbore cutters.

In all cases, the depth of cut was one-quarter the counterbore diameter.

Carbide counterbores were run at approximately 185 sfpm. with feeds per tooth of 0.00025 to 0.0017 in. A few runs at feeds to 0.0035 per tooth were made.

High-speed steel counterbores were run at 55 to 126 sfpm., with feeds per tooth duplicating those of the carbide counterbores.

Coolant: Carbide counterbores were operated dry. With the high-speed-steel counterbores, a 16:1 water-soluble emulsion type coolant was applied copiously.

Tables I and IV are typical examples of the recorded data.

How Data Are Used

Formulas for computing torque, thrust and power when counterboring SAE 1020 cold-drawn steel, no coolant, with carbide cutters are:

$$T_o = 4130\ nf\ (D_c^2 - D_p^2) \qquad \text{(See Fig. 1)}$$

$$T_h = 232{,}000\ nf\ \frac{(D_c - D_p)}{2} \qquad \text{(See Fig. 2)}$$

$$Hp_c = 79\ n\ \frac{Nf}{100}\ (D_c^2 - D_p^2) \qquad \text{(See Fig. 3)}$$

Where:

T_o = torque, lb.-ft.
T_h = thrust, lb.

Table I . . TORQUE AND THRUST WITH CARBIDE-TIPPED COUNTERBORES

MATERIAL CUT	Bhn	TORQUE Lb. Ft.	TORQUE Factor	THRUST Lb.	THRUST Factor
SAE 1020 Cold-Drawn	180	16.5	1.0	258	1.0
SAE 6150 Hot-Rolled	195	21 9	1.33	445	1.72
SAE 6150 Heat-Treated	241	35.0	2.12	540	2.09
Tool Steel 1% C, annealed	156	31.0	1.88	785	3.04
Cast Iron 40,000 psi.	210	14.0	0.85	180	0.71
Monel	207	32.0	1 94	350	1.36
Phos. Bronze	156	12.5	0.76	210	0.82
Leaded Brass	124	6.2	0.38	54	0.21
Aluminum Alloy 24ST	154	8 9	0.54	210	0.82
Aluminum, 2S	36.6	23.0	1.39	695	2.70
Magnesium, Cast H-alloy	63.4	4.1	0.25	69	0.27

Table II . . CORRECTION FACTORS WHEN USING CARBIDE-TIPPED COUNTERBORES

MATERIAL CUT	Bhn	TORQUE Factor	THRUST Factor	HP. Factor
SAE 1020 steel, cold-rolled	180	1.0	1.0	1.0
SAE 6150 steel, hot-rolled	195	1.3	1.8	1.3
SAE 6150 steel, heat-treated	241	2.1	2.1	2.1
Tool steel, 1% C, annealed	156	1.9	3.0	1.9
Cast iron, 40,000 psi.	210	0.85	0.7	0.85
Monel metal	207	1.9	1.4	1.9
Phosphor bronze	156	0.76	0.82	0.76
Leaded brass	124	0.38	0.27	0.38
Aluminum alloy, 24ST	154	0.54	0.82	0.54
Aluminum, soft 2S	36	1.4	2.7	1.4
Magnesium, cast H-alloy	63	0.25	0.27	0.25

Table III . . CORRECTION FACTORS WHEN USING H.S.S. COUNTERBORES

MATERIAL CUT	Bhn	Cutting Fluid	TORQUE Factor	THRUST Factor	HP. Factor
SAE 1020 steel, cold-rolled	180	16:1 emulsion	0.85	0.89	0.85
SAE 6150 steel, hot-rolled	195	16:1 emulsion	1.3	1.2	1.3
Cast iron, 40,000 psi.	210	Dry	0.73	0.79	0.73

Table IV . . MOTOR HORSEPOWER FOR THREE-TOOTH CARBIDE-TIPPED COUNTERBORES

The three-tooth, 1¼-in. dia. counterbore had a ½-in. pilot and was operated at a cutting speed of 189 sfpm. without a cutting fluid.

MATERIAL CUT	HORSEPOWER AT MOTOR, Hp_s FEED, INCHES PER TOOTH			CUTTING PERFORMANCE
	0.00025	0.0005	0.0015	
SAE 1020 Steel Cold Drawn	2.6	3.05	5.4	Smooth cutting. Good finish.
SAE 6150 Steel Hot Rolled	3.0	3.85	7.25	Smooth cutting. Good finish.
SAE 6150 Steel Heat-Treated	4.25	4.75-5.9	8.6	Chatter at low feeds. Smooth cutting and good finish at higher feeds.
1% C Tool Steel Annealed	4.34-4.8	5.25-5.9	8.7	Large built-up edge chips tools. Light chatter. Finish rough.
Cast Iron 40,000 psi.	2.8	3.25	4.80	Light chatter at low feeds. Segmental chips. Finish fair.
Monel	3.6-4.0	4.8-6.2	7.6-10.25	Chips bind but do not pack. Finish good. Chips red hot.
Phos. Bronze	3.25	3.75	5.4-5.7	Continuous chips. Good finish. Smooth cutting.
Leaded Brass	2.9	3.15	3.9	Free cutting. Good finish.
Aluminum 24 ST	3.2	3.45	4.35	Free cutting. Light chatter at low feeds.
Aluminum 2 S	3.4	5.3	7.5-8.75	Chips pack in flutes causing clogging and seizure. Poor finish.
Cast Magnesium H-Alloy	2.95	3.15	3.5	Free cutting. Good finish.

Idle Horsepower, hp_t, varied from 1.6 to 3.0 for the milling machine used.

Hp_c = horsepower at the cutter
Hp_{ct} = horsepower per tooth at cutter
N = rpm of counterbore
n = number of teeth in cutter
D_c = counterbore diameter, in.
D_p = pilot diameter, in.
f = feed, inches per tooth
Hp_s = gross horsepower to motor
Hp_t = tare or idle horsepower

Example:

Typical values for counterboring SAE 1020 steel dry with carbide-tipped counterbores under these conditions $D_c = 1$ in., $D_p = ½$ in., $n = 3$, $N = 707$, sfpm. $= 189$, $f = 0.0005$ ipt., are:

T_c = 4.64 lb.-ft.
T_h = 87 lb.

Horsepower at the cutter, Hp_c is found by obtaining Hp_{ct} from Fig. 3 and multiplying by $n \times N \div 100$, as:

$$Hp_c = 0.029 \times 3 \times \frac{707}{100} = 0.62$$

$$Hp_s = \frac{hp_c}{\text{Mech. Eff.}}$$

$$Hp_t = \frac{0.62}{0.80} + 2.0 = 2.77$$

Correction Factors

To cut other materials with carbide tools, multiply the results of graphical solution of torque, thrust and power, Figs. 1, 2 and 3, by the correction factors in Table II.

When using high-speed-steel counterbores, multiply the values obtained by graphical solution by the correction values given in Table III.

In either case, the values so obtained are for sharp cutters. If the cutters are dull, the values obtained must be multiplied by two.

Tips FOR TOP SHOP MEN

274 Do you believe in your own products? Do you use them yourself? These sound like specious questions, of course. But remember that your customers, prospects and visitors judge from appearances—so be sure that you "take your own medicine," that your applications of your own products are obvious and evident in your shop. And be further sure that you're proud of their appearance, sound in the results you get with them.

275 Keep your opinions of subordinates to yourself — or tell them directly. Don't broadcast your opinions to their fellows, unless you have the rare case in which your opinion, repeated by others, is more effective than your direct statement.

276 Keep your critical eye on time-hallowed systems. Times and needs change, and you may find some parts of your systems in need of drastic revision.

277 Challenge your own preferences. Do you prefer air over electricity, bolting over welding, milling over shaping? Each should be used in its proper place, not ticketed as a pet or a pariah.

278 To make a man who works for you feel tops, ask his advice. It's an old rule that if you want a man to like you, get him to do you a favor—advice is something the giver values more than gold.

279 Are your stockbins clean? Do you know what's in them? Are numbered parts and tools in numerical order so they're easy to find—or is each new thing chucked into the nearest vacant bin? If you want to save costly searching time, get system into stores and cribs.

ROUND TABLE

Clique or Click?

"Why the gloomy look, Ed? You look as though you'd lost your best friend."

"I have, Al—my sense of balance. Just when things seem to be going along pretty smoothly, along comes another problem that throws me. Tell me, how would you handle a situation in which one of your men asked you for a job for his younger brother, when there are already two of the same family in your shop?"

"I don't know that it would bother me so much, Ed, providing the two that I had were good workers, as is the case with the Williams boys."

"How the devil did you know it was the Williams family I was thinking about?"

"Roy made a crack to me the other day about getting his kid brother on, Ed, but I didn't pay much attention to it at the time."

"Having too many of a family in the shop sorta does things to me, Al. I don't mind having a couple, but when it gets to be above that I sort of draw the line—I don't think it is a good thing."

"I think you're making a mountain out of a mole hill, Ed. What in particular can you put your finger on, Pal? Give me one thing that makes the employing of relatives unsatisfactory. After all, Studebaker has been bragging for years about sons following their fathers in the same department."

"Well, let's say, for instance, that I have trouble with one member of the family—don't you suppose that the trouble will be carried home and be considerably built up by the relatives? Then I've got trouble with the whole family."

"What of it? Let 'em get it out of their system, Ed!"

"Well, Al, suppose that Bill quits because of some disagreement—what do you suppose the other members of the family are going to think about it?"

"Ah, phooey, you've been listening to too many hair-raising stories on the radio. As far as I'm concerned, I wouldn't feel any different if I had the whole family working for me. Usually, you get some family feeling out of it that helps morale rather than hurts it."

"I'm in favor of a rule that no more than two members of any one family should be employed in any department—to prevent cliques."

"And I'm in favor of topping off the gang with the grandmother, Ed, if she can do the job. They won't clique up any more than lodge brothers do—or guys from the same part of town."

IS IT DANGEROUS *to have relatives working together? Do they become a "gang" or pressure bloc? Your opinions and ideas on this subject will help others. Discussions of earlier topics appear on later pages.*

BY ELBERT C. KIRKHAM
Curator, Utah Engineering Experiment Station
UNIVERSITY OF UTAH

Rapid Tests for Identifying Alloy Steels

Innumerable problems of segregating stocks of various alloy steels have arisen because of the increased use and wide distribution of these materials. In spite of all precautions, steel stocks, welding rods, metallizing wire and high-speed steels often lose identifying markings. This situation can occur in the warehouse, company stockroom, on the shop floor. When it happens, response of the material to heat-treatment becomes questionable. Valuable steels must then either be discarded or relegated to low-grade uses.

In the jobbing shop, a somewhat different problem occurs: What steel was used in worn-out parts to be replaced? Generally there is no time for chemical analysis, even if cost permits.

Many schemes for quick checking of steels have been developed. Some are not widely used because they appear too intricate for the average worker in the shop.

As storekeeper in charge of a large steel warehouse during the war, the author found that four days were normally lost in obtaining a costly chemical analysis from a laboratory. Hundreds of manhours were also lost needlessly for lack of a simple method of identifying alloy steels painted with diverse color codes. So he set about to improve existing chemical spot tests for alloying constituents

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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like nickel, chromium, and molybdenum, and originated a test for manganese. Then he developed a rapid combination spot test whereby 16 individual tests on four alloy steels can be run in ten minutes.

The chemical kit required is simple; anyone may develop sufficient skill to use the tests. Proof of the value of the tests is a five-year record, whereby the author has identified alloy and high-speed steels and given heat-treatment specifications and welding procedures proved correct by consistent results and scientific instruments like the Spectrograph and the Rockwell hardness tester. His work has been aided by many companies and individuals, and there is currently a considerable demand for the information contained in this Special Report.

PREPARATION OF SOLUTIONS

Dissolving Solutions[2]

No. 1—25 ml. water, 20 ml. conc. nitric acid (HNO_3), 5 ml. of 0.85% phosphoric acid (H_3PO_4).

No. 2—50 cc. hydrochloric acid (sp. gr. 1.05)

Nickel Test Solution[3]

0.50 g. dimethlglyoxime, 30 cc. glacial acetic acid, 15 ml. NH_4OH, and 5 g. ammonium acetate.

Chromium Test Solutions

No. 1—Sodium hyprobromite solution: 50 ml. water, 2.50 g. sodium hydroxide (NaOH), 1.25 ml. bromine Br_2, or 25 cc. saturated bromine water. Caution: Handle liquid bromine only under a well-ventilated hood. Avoid contact of bromine with body. Wear rubber gloves. Replace if yellow color fades.

No. 2—Sulphuric acid (1-5): 50 ml. water, 10 ml. conc. H_2SO_4.

No. 3—Phenol solution. 5 g. phenol (carbolic acid) crystals C_6H_5OH, 50 ml. acetic acid (CH_3COOH).

No. 4—Diphenyl carbazide indicator solution. Dissolve 0.050 g. of 3-diphenyl carbazide, in 2.5 ml. of acetic acid and dilute to 50 ml. with ethyl alcohol; methyl alcohol works just as well. Store in an amber dropping bottle. Replace solution if it becomes strongly colored. Run a blank test.

Manganese Solutions

No. 1—45 cc. water, 6 cc. nitric acid, and 2 cc. conc. sulphuric acid.

No. 2—1 g. sodium bismuthate and 60 cc. water.

Molybdenum Solutions

No. 1—Stannous chloride solution. Gently heat to dissolve 25 g. stannous chloride in 35 cc. conc. hydrochloric acid. Dilute to 100 cc. by adding cold distilled water. Keep solution in dark bottle. Add a few pellets of metallic tin to prevent oxidation.

No. 2—5 g. sodium thiocyanate and 95 cc. distilled water.

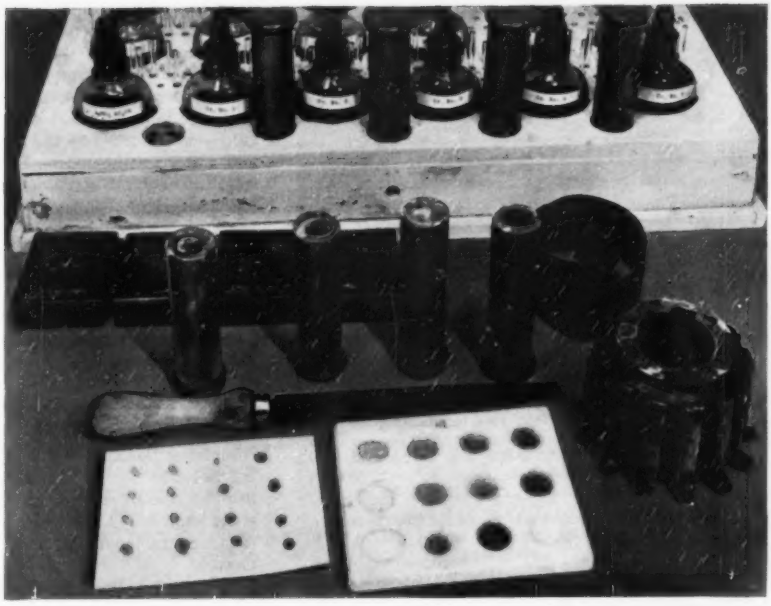
Spot test kit for an experienced operator and, below, arrangement of solutions

Distilled Water	Manganese No.1	Manganese No.2	Nickel Test Sol'n
Dissolving No.1	Dissolving No.2	Molybdenum No.1	Molybdenum No.2
Chromium No.1	Chromium No.2	Chromium No.3	Chromium No.4

CHEMICALS AND EQUIPMENT

ACIDS	REAGENTS	
Acetic	Ammonium acetate	Methyl alcohol
Carbolic	Ammonium hydroxide	Sodium bismuthate
Hydrochloric	Bromine water (saturated)	Sodium hydroxide
Nitric	Dimethlglyoxime	Sodium thiocyanate
Phosphoric	Diphenyl carbazide	Stannous chloride
Sulphuric	Distilled water	Tin (metallic)

Twelve 2-oz. (60-cc.) dropping bottles (dark glass)	Standard steel samples
4-mm. glass sampling rods 3 in. long	Welding rod samples
White blotters	File
Coors spot plates (white) No. 00	Emery cloth
Two 50-ml. beakers	2¼ in. round bottle with lid



Nickel spot tests (on blotter) show color variations corresponding to nickel content of samples. Chromium tests are made in upper two rows of spot plate and reveal: a blank, 0.50%, 1% and 4% chromium. Manganese tests for samples are in lower row of spot plate. Round Jominy bars are known steels for comparison purposes

How Spot Tests Are Made

FROM the start, the Riehle axiom, "One test is worth a thousand expert opinions," was followed in the search for rapid, trustworthy methods for identifying steels. Chemical spot tests [7, 11] appeared to be the best means of attaining the desired ends, plus samples of known steels for comparison purposes. For the latter, Jominy test bars[8] were selected because of their availability. As known standards they serve to confirm spot and spark tests.

Before spot tests are run, the unknown steel should be spark tested.[12] Observance of the spark pattern will often provide a good indication of the type of steel in hand and avoid unnecessary spot testing. If carbon bursts are lacking in the spark pattern, or the combination of a low carbon indication and a bright surface suggest stainless steel, the magnet test[9] should follow immediately.

The spark test is often of great assistance in segregating high-speed steels, chisel steels and oil-hardening steels. Estimation of the carbon content from the spark test is often sufficient for identification, but the Jominy test affords a closer determination when the quantity of steel warrants. In classifying steels to make machine parts, particularly gears, the possibility of encountering carburized surfaces must always be considered.

Testing for Nickel

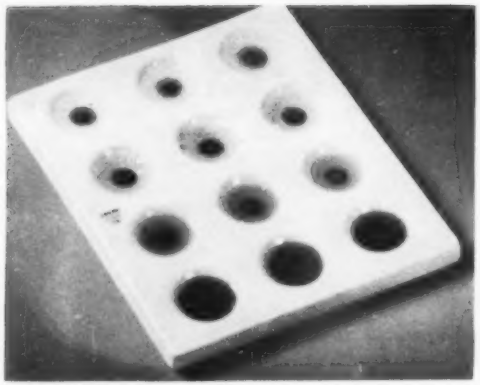
Drop two drops of Dissolving Solution No. 1 on a cleaned portion of the unknown steel. At the first indication of a bubbling reaction, transfer drops from the reacting solution to blotter paper with a glass sampling rod. If the first dissolving solution reacts slowly, add a drop of Dissolving Solution No. 2, and continue to transfer drops from the spot on the steel to the blotter paper. To each test spot on the blotter add a drop of nickel test solution. A pink or red spot on the blotter indicates nickel.

If no pink or red indication is secured, continue to observe the nickel test spots for a few minutes. If the first test spots taken are light yellow and the last spots are brown, a blank test for nickel is usually indicated.

Tests made on steels containing only 0.17% nickel will show a very pale pink on the first drops take. from the reacting acid spot. Steels having a trace of nickel, say 0.09%, are very difficult to detect. Iron interferes with this test for low nickel steels, and the spots are rust brown before the identifying pink color forms.

Bright-finish steels, which react only when Dissolving Solution No. 2 is added to the acid spot may turn yellow-green; spots on the blotter turn bright red when the nickel test solution is added. These two indications suggest high nickel or stainless steel. (See "Stainless Steel" below).

If steels with a bright finish do not respond to the nickel test, and are acid resistant, they should be given the chromium test. If the chromium test is negative, grind off a small spot and make a sec-



Manganese tests are highly selective of alloy content. Row of light spots—SAE 1095 steel containing less than 0.25% manganese. Succeeding rows represent 1.20% Mn., NE 9445 steel, 1.60% Mn. Stentor oil-hardening steel and manganese-nickel welding rod

ond test. The specimen may be coated with an interfering element.

Manganese Spot Test Developed

For lack of a good spot test for manganese, low-carbon steels and free-machining screw stocks could not be separated. Filings from manganese steel dissolved in a test tube with sodium bismuthate sometimes produced a violent permanganate color. There was no control over the reaction. Finally, it was observed that the test solution must be cool and dilute.

The bismuthate method as described by Willard and Diehl[2] specifies the concentration of nitric acid and also the temperature at which oxidation takes place. By addition of sulfuric acid to the solution oxidation takes place more rapidly at room temperature. The solutions for the manganese test as given herewith and the procedure below provide consistent and posittive tests for manganese in many steels.

Testing for Manganese

After two drops of Dissolving Solution No. 1 have reacted on the steel, wait until larger bubbles appear on the acid spot and then transfer a drop of the reacting acid solution to a spot plate containing three drops of Manganese Test Solution No. 1. Shake the dropping bottle containing Manganese Solution No. 2, and add one drop to the depression holding the test drop. With the spot plate flat on the table, shake it with a circular motion. Excess sodium bismuthate will now settle to the bottom of the depression and form a round dark spot.

Observe the spot for several minutes and continue to shake. High manganese content in the steel is indicated when the solution in the depression turns permanganate (pink-red-lavender) color. Low-manganese steels take several minutes for the pink color to appear. Keep the spot plate clean of iron filings or grinding dust, because even a fine iron particle in the test spot will cause the color to disappear.

Here are a few suggestions: Always use a slight excess of sodium bismuthate in the spot-test depression. Add a second drop if needed. If no manganese is indicated by the first test, transfer a second and a third sample drop from the acid spot on the steel to the same spot-test depression. Shake again with a circular motion and observe. Steels with very low manganese content can be detected by this method.

The manganese test solution must be replaced when the sodium bismuthate in the bottom of the bottle turns from the yellow to gray. Ordinarily, both nickel and manganese test solutions last many months.

Molybdenum

On a clean spot on the steel drop two drops of Dissolving Solution No. 1 and one drop of Dissolving Solution No. 2. Let this react a minute or so. Stir the spot by rubbing the steel with the end of the glass sampling rod. Transfer a series of drops of the reacting acid solutions from the steel to the blotter.

To each test spot on the blotter add one drop of Molybdenum Test Solution No. 1 and one drop of Molybdenum Test Solution No. 2. Hold the blotter in front of a light and observe the blotter immediately around the center of the spot. An orange-colored halo indicates molybdenum. Steels with as low as 0.05% molybdenum have been detected. If a trace is suspected add two or three sample droplets of the reacting-acid steel solution to a single spot on the blotter. This concentration will increase the sensitivity of the test.

Samples taken from an acid spot on the steel after the reaction has stopped and the bubbles have disappeared will not produce the right result.

Chromium

Two drops of Dissolving Solution No. 1 are placed on a clean spot on the steel. In about ten seconds, when fine white bubbles rapidly come up, transfer a sample drop to a spot-plate depression containing three drops of Chromium Solution No. 1. Sampling is best done by touching the steel with the glass rod and gently rubbing a split second. To the spot-plate depression add one drop of Chromium Solution No. 2 and stir until the flocculent brown precipitate disappears. A drop of Chromium Solution No. 3 is next added. The light yellow color will clear and usually there will be a white precipitate. Add a drop of Chromium Solution No. 4. A purple color usually indicates chromium.

Important things to watch during this test are: A purple color may appear, but no chromium is present; the Chromium Solution No. 4 turns light red in time and then gives a pale purple color in the spot plate. However, if a blank test is run at the same time and the test from the steel shows a darker purple, chromium is indicated. When Chromium

Solution No. 1 is no longer yellow, it should be replaced.

The two solutions mentioned are the only ones that need to be watched for changes in effectiveness; they usually remain good for several weeks

Chromium steels of less than 0.50% have been indicated and separated from steels containing 1.00%.

When very high chromium is found on bright hard steel, suspect chromium plate. Remove the surface on a large enough spot so the acid does not reach the plating. Repeat the chromium test. A negative result then indicates chromium plate only.

Sixteen Analyses at Once

Timing of the tests is very important. If acid is allowed to react with the steel longer than ten seconds, before taking the sample drop for the nickel test, the results will be in error. Likewise, a delay in excess of 30 sec. in making the chromium test causes poor results. Fortunately, when testing four steels at once, according to a specific technique, the timing is automatic. These four steels can either be all unknowns, or one unknown plus a blank like SAE 1095 (no alloy) and two alloy steel standards chosen to bracket the supposed composition of the unknown.

The procedure for making 16 analyses at once is:

Three drops of Chromium Solution No. 1 are placed in each of four depressions on the spot plate, and three drops of Manganese Solution No. 1 are placed in another set of four depressions. Three drops of Dissolving Solution No. 1 are then placed on a clean spot on each sample.

The acid solution is allowed to react about ten seconds, then the spots are stirred with flat-ended glass sampling rods. Samples of acid solution are transferred to the blotting paper and to the spot plate in the following order: (1) the blotting paper for the nickel tests, (2) to the Chromium Solution No. 1 in the three spot-plate depressions, and (3) to the Manganese Solution No. 1 in the second set of spot-plate depressions.

One drop of Dissolving Solution No. 2 is added to the acid spots on the steels and allowed to react 15 sec. Then the sample drops for the molybdenum tests are transferred to the blotting paper.

Next, a drop of Manganese Solution No. 2 is added to each depression containing the manganese test. Likewise, a drop of Chromium Solution No. 2 is added to the chromium tests. The plate is then shaken flat on the table with a circular motion to dissolve the flocculent brown precipitate in the chromium test spots and to coagulate the excess sodium bismuthate in the manganese tests spots.

If precipitates of the chromium test do not disappear while shaking the plate, a second drop of Chromium Solution No. 2 is added to speed up the action. After the precipitate has disappeared, one drop of Cr. Sol. No. 3 is added to destroy the light yellow color, and then finally a drop of Cr. Sol. No. 4. Presence of chromium is indicated by a violet color, the depth of which varies with the percentage of chromium in the steel.

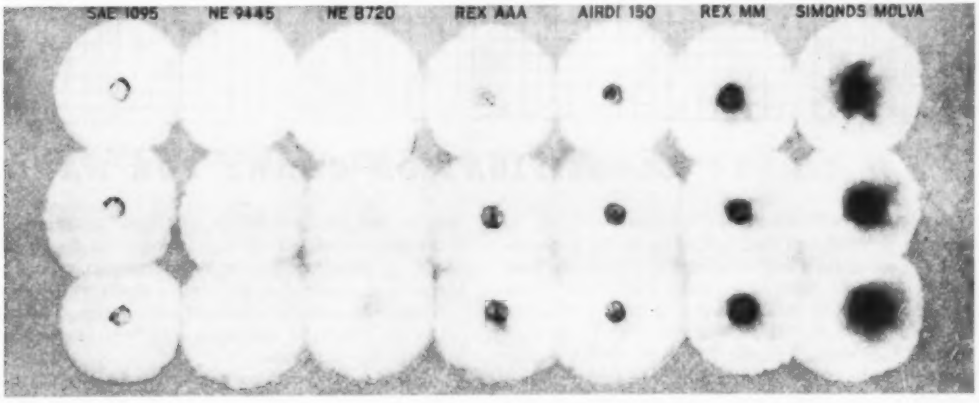
Nickel tests are completed by adding one drop of the Nickel Test Solution to each nickel test spot on the blotting paper. The percentage of nickel is indicated by the intensity of the red color with dimethlglyoxime.

To the remaining molybdenum test spots on the blotting paper, one drop of Mo. Sol. No. 1 and then one drop of Mo. Sol. No. 2 are added. The presence of molybdenum is shown by the formation of an orange halo in the spots.

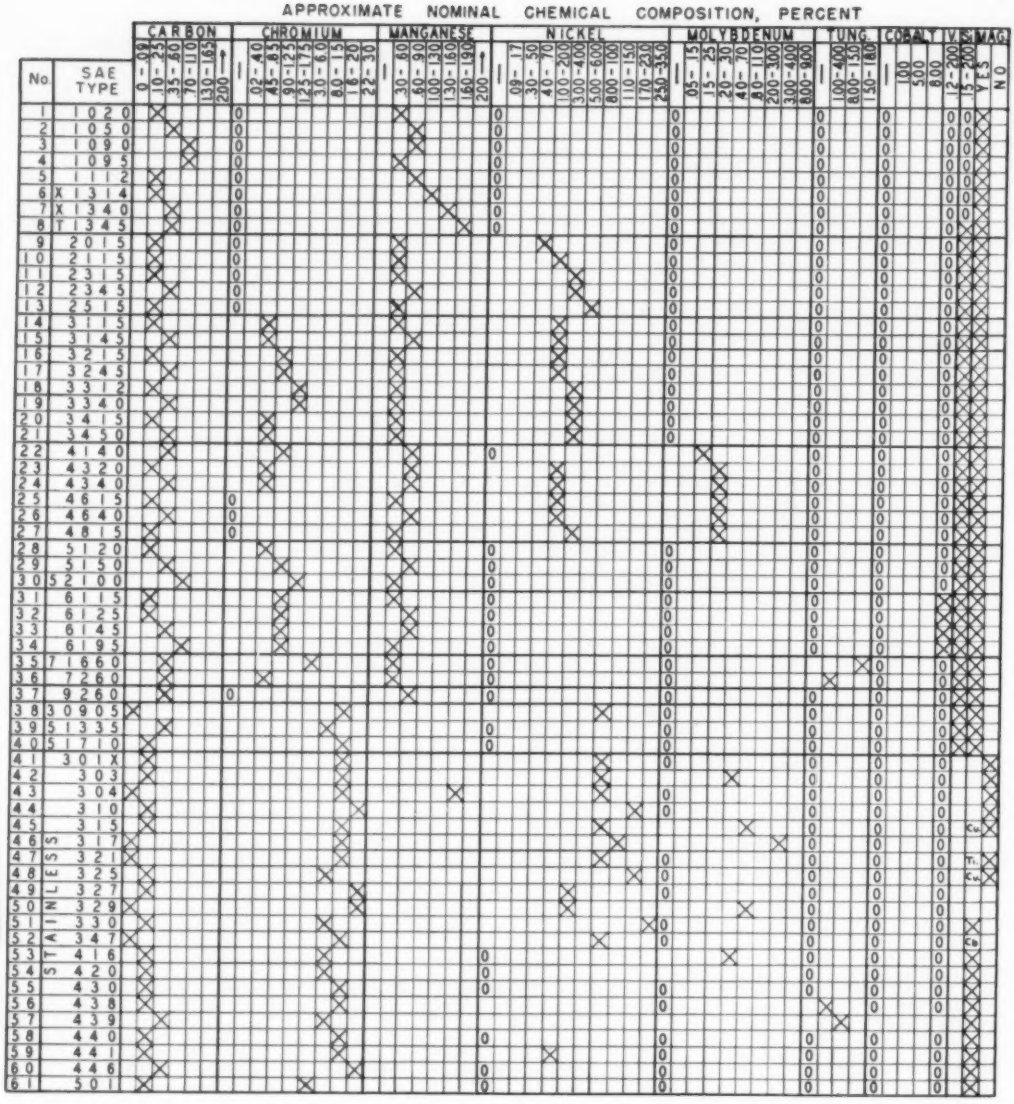
Knowns Run With Unknowns

The use of standard steel samples run simultaneously with unknowns, make it possible to classify the unknown steel quite accurately. For example, an unknown was supposed to be armor plate. It was run simultaneously with SAE 1095 and NE 9445. The spark test indicated the unknown

(*Continued on page* 100)



Molybdenum spot tests (on blotter) show by depth of an orange halo around the center spot the increasing percentages of alloy for these steels: SAE 1095, NE 9445, NE 8720, Rex AAA, Airdi 150, Rex MM and Simonds Molva

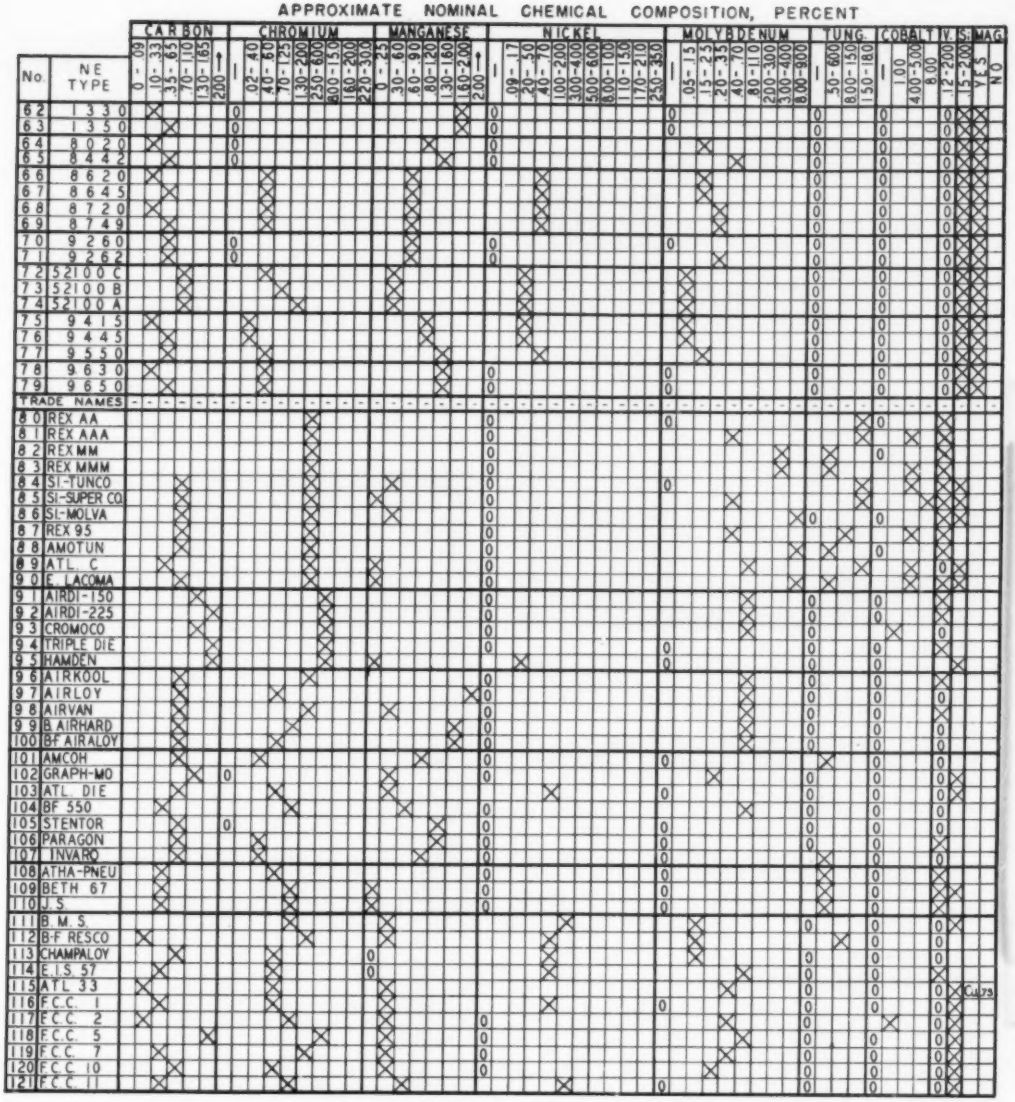


CLASSIFICATION CHART FOR RAPID

THIS CHART will assist the spot-test operator to classify an unknown steel according to the approximate nominal chemical composition. Listed are SAE steels, National Emergency alloy steels and a few well-known tool steels according to tradenames. Steels 80 to 90 are high speed steels; 91 to 95, high carbon-high chrome steels; 96 to 100, air-hardening steels; 101 to 107, oil hardening; 108 to 110 punch and chisel; 111 to 114, tool steels containing nickel; 115, non-tempering steel. The six steels from one firm, 116 to 121, illustrate how steels from one source can be classified to suit one's convenience.

Percentage classification, the key that opens the door of identification, is developed according to experience received in spot testing steels with known approximate nominal chemical composition. In some cases the results of spot tests have been checked by quantitative analysis.

This is how the chart can be used. Lay the top edge of a blank sheet of paper along the bottom line of the list of percentages, and the left edge of the paper even with the line just to the right of the list



IDENTIFICATION IN SPOT TESTING STEELS

of steels. Mark the results of your spot tests on the top edge of the blank paper.

Example:

1. Spark test gave an indication of 0.50% carbon. Mark an "x" under the 0.50-0.60 carbon column.

2. Spot test showed 1.00% chromium. Mark an "x" in that column.

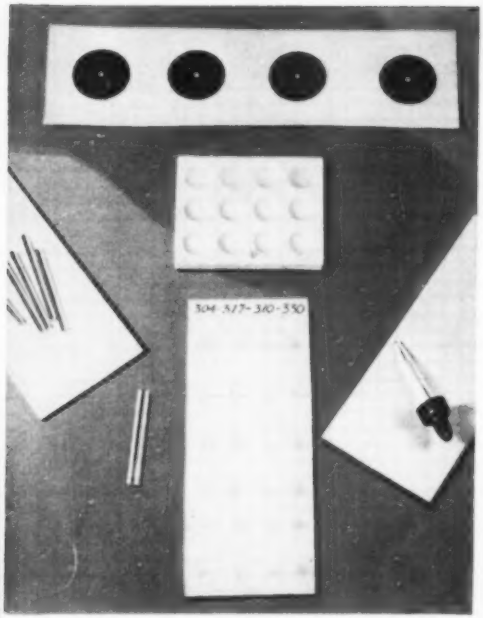
3. The nickel test was blank. Mark an "o" in that column.

4. Spot test showed 0.15-0.25% molybdenum. Mark an "x" in the appropriate column on the paper.

5. Tungsten and cobalt were blanks. Mark an "o" in appropriate columns.

Now slide the paper down until each "x" and "o" marked on the top edge of the sheet match a steel entry. In this case there is only one steel of the approximate analysis, namely SAE 4140.

Once the type of steel is known, verification of the steel can be obtained by running spot tests on the unknown in comparison with known standard steels bracketing the suspected analysis.



Stainless steels are rapidly segregated by dilution of the nickel spot test. Samples of steels are laid out at top of testing area; the spot tests are made in a diluted sequence on a blotter below

had less carbon than NE 9445; that is, just less than 0.45% while the spot test showed 0.40-0.60% chromium, 0.15-0.25% molybdenum with less manganese than NE 9445; that is, less than 1.00% manganese, and the nickel spot test was a blank. A quantitative analysis was then run by expert analysts with the following results: carbon 0.35%, chromium 0.55%, molybdenum 0.15%, manganese 0.71%, nickel 0.09%, and less than 0.01% tungsten.

Segregation of Alloys by Percentage Content

In experimenting with the spot test kit, a discernible increasing color scale was produced, with steels having these percentages of elements:

Nickel: 0.17%, 0.30%, 0.40%, 0.50%, 0.70%, 1.00-2.00%, 4.00%, 9.00%, 11.00%, 20.00%, 35.00%.

Chromium: 0.30%-0.50%, 0.55-0.70%, 0.80-1.10%, 4.00% and 12.00%.

Manganese: 0.25-0.50%, 0.60-0.90%, 1.00-1.30%, 1.60% and over 4.00%.

Molybdenum: 0.05-0.15%, 0.15-0.25%, 0.50%, 0.80%, 4.00% and 8.00%.

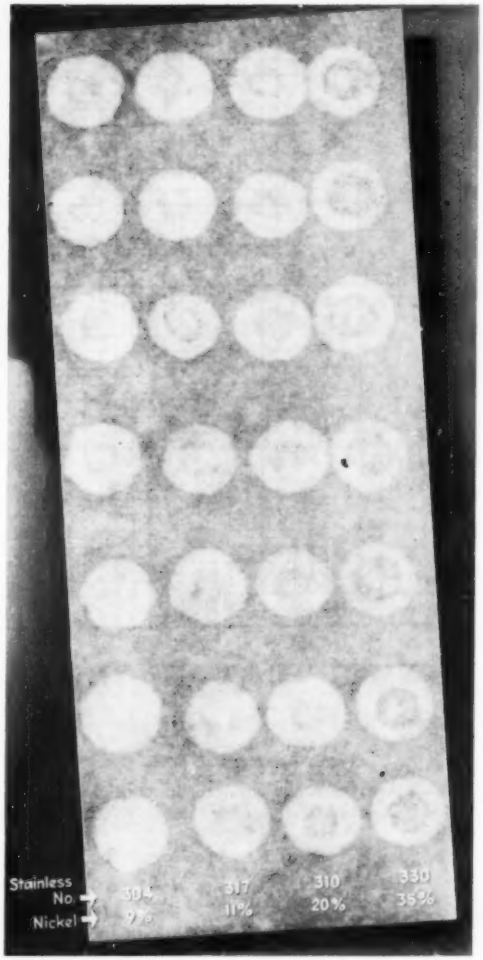
SAE and NE Steels Classified

The plain carbon steels can be identified by lack of chromium, molybdenum and nickel, the SAE steels of 2XXX range by lack of chromium and molybdenum, and the presence of nickel. Steels with low chromium, medium nickel and no molybdenum fall in the SAE 31XX range. SAE 32XX and SAE 33XX steels are identified by higher percentages of nickel and chromium with a blank test for molybdenum.

The NE 13XX steels show a higher manganese test than the NE 94XX steels, and of course the lack of nickel, chromium and molybdenum verifies the test for NE 13XX steels.

Manganese-molybdenum NE steels lack chromium and nickel. The NE 86XX and NE 87XX steels are separated by the difference in molybdenum content, and the presence of chromium, nickel and manganese must be verified. NE 94XX and NE 95XX are identified by the percentage of molybdenum.

If the molybdenum test is the deciding element as in the case of NE 86XX and NE 87XX steels, a series of spot tests will aid in determining the percentage of molybdenum in these steels. A series of reacting acid drops are simultaneously transferred



to the blotting paper at 2-sec. intervals. When molybdenum No. 1 and No. 2 solutions are dropped on the sample spots on the blotter paper, the steel with the higher percentage of molybdenum will show the orange halo first.

Stainless Steels[9]

Effect of Dissolving Solution No. 1 on stainless steels is unnoticeable. Hence, to obtain a sample, Dissolving Sol. No. 2 (HCl) is placed on the same spot after the first acid has been on the steel for about 15 sec. In presence of stainless steel, this combination of acids usually turns greenish yellow. Spot testing follows after reaction of the combined acids. Hydrochloric acid interferes with determining percentage of manganese, but the results are usually sufficient to aid in identification of the steel.

Types 304, 317, 310 and 330 stainless steels can be separated with the nickel spot test by diluting the sample drop. The regular combination test is first run to check for the presence of chromium and absence of molybdenum. Nickel spots for this first test all look alike and the percentage is not detectable. However with the following dilution methods of sampling, a definite color variation is obtained.

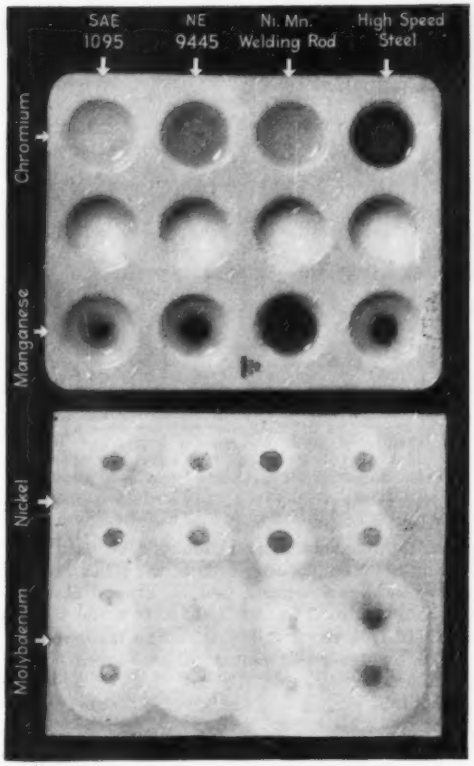
Two drops of Dissolving Solution No. 1 are placed on each steel then one drop of Dissolving Solution No. 2. After the reaction stops, one more drop of Dissolving Solution No. 1 is added and allowed to react a minute or so. Now the acid spots should look alike. Place 20 drops of distilled water in four depressions of a spot plate and transfer one drop of the reacting acid solutions from each stainless steel and stir well. From the diluted solutions in the spot plate transfer a drop to blotter paper and add one drop of nickel test indicator. The sample drops can be diluted step by step, and one by one the pink nickel spots on the blotter paper become clear. Finally, the one with the highest percentage of nickel will be the only one to have a pink color.

Steels with 0.17% and 0.30% nickel content will show little variation of color intensity on the first test. The following procedure will permit positive semi-quantitative determination of nickel.

Two drops of Dissolving Solution No. 1 are placed on each steel. Six samples of the reacting solutions from each specimen are transferred to blotter paper at 2-sec. intervals. Spots from the steel with the higher nickel content develop the characteristic color first, while the spots corresponding to the lower nickel content are blank for the first samples. Comparison of the depth of the color of these timed series of spots permits a fairly accurate estimate of the nickel content, when known samples are used as a guide.

Spot Test Sampling of High-Alloy Steels

High-speed steels and high-chrome-high carbon steels often present the problem of obtaining a sample drop containing comparable representative amounts of each alloying element. Experience shows that the following procedure is practical and rapid.



Combination tests on four materials can be handled in 10 min. Blotter (below) shows variations in nickel and molybdenum contents. Spot plate (top) shows one row of chromium tests, which for the respective materials indicate: no chromium, 0.50%, 1.00% and 4.00% chromium

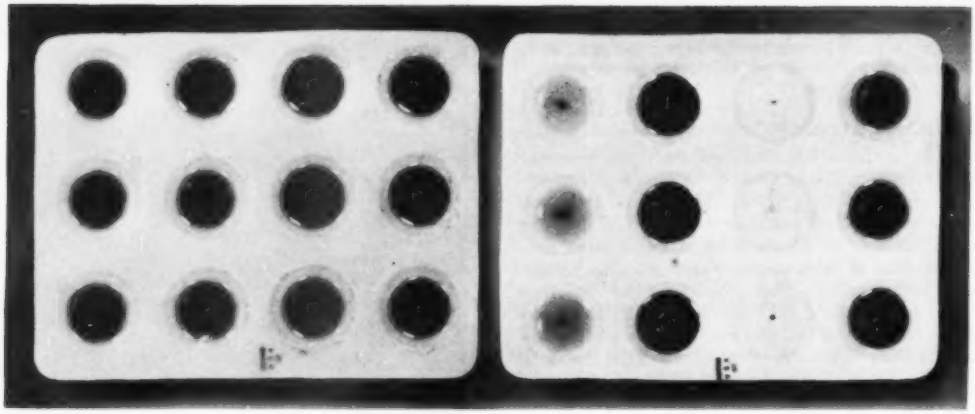
Apply both dissolving solutions to the steels and let them react several minutes. Wipe the acids off the sampling spot. Apply Dissolving Solution No. 1 a second time to the same sampling spots. Both types of steels should react immediately. Samples taken in from 10 to 20 sec. should result in similar brown precipitates in spot-plate depressions containing Chromium Solution No. 1.

Iron is the main constituent of the steel and the brown precipitate represents the quantity of iron taken in the sample drop. It can be assumed that if the brown precipitates are alike the sample drops have comparable representative amounts of the other elements in the steel. However, sometimes both dissolving solutions are required to obtain a representative sample.

Spot Test for Cobalt

Here is a modification of the hydrochloric acid test for cobalt[11] in high-speed steels.

After the spark test indicates a high-speed steel,



High-speed steels are quickly segregated by chromium and molybdenum spot tests. Left spot plate: 4% chromium for all steels; right spot plate: 0.50% 4%, a blank, and 4% molybdenum. The steels were: Rex AAA, Rex MMM, Simonds Turco and Rex MM and they were segregated in a few minutes

either the tungsten or molybdenum type, drop Dissolving Solution No. 1 on each of the steels and let them react a few seconds. Add one drop of Dissolving Solution No. 2 to each spot. Note if the second acid (HCl) gives a yellow center to the bubbling spot or a blue-green center. A blue-green center is the first indication of cobalt.

The following procedure gives a better cobalt color:

Remove nearly all the bubbling acids from the steels with a blotter or rag. On the same spot lay a piece of filter paper about 1-in. square and press against the steel. Place a drop of Dissolving Solution No. 2 on the filter paper directly over the spot, and make sure the hydrochloric acid wets the steel under the filter paper. Watch the filter paper for a minute or so. Steels having no cobalt will stain the filter paper with a light yellow color. Cobalt steels will stain a deep blue spot in the center of the filter paper with a lighter blue-green shading around the edge.

To separate two steels with large amounts of cobalt such as steel No. 85 (see chart) containing 8% cobalt and steel No. 84, with 5% cobalt, the following method can be used:

On prepared spots on each steel place drops of Dissolving Solution No. 1 and let them start to react. With a glass sampling rod in each hand simultaneously transfer a series of sample drops to the blotter paper. On the test spots on the blotter place a drop of Dissolving Solution No. 2 (HCl). The spots will have a darker center with a bright green halo. The steel with the higher percentage of cobalt will have the most green in the spot. A yellow spot indicates no cobalt.

High-nickel stainless steels given this test show green while the acid is reacting but turn yellow (showing no cobalt) when the HCl is added to the spot on the blotter.

High-Speed Steels Spot Tested

Quite often high-speed steels are known by their red tungsten spark test. In some steels of this group, where the tungsten content is low or entirely lacking, the molybdenum content runs from 8 to 9%. Information published by the Norton Company on the spark test[19] should be kept in mind when attempting to identify unknown steels.

Most common high-speed steels have from 1.00% to 2.00% vanadium.[20] Vanadium steels[20] are most generally known by their characteristic physical properties such as a very small grain size and increased depth of hardness after heat-treatment. Jominy hardenability bands developed for vanadium steels have shown the tendency toward an increase in the depth of hardness.

A new spot test for vanadium[21] if adaptable to identification of steels, would help to identify a steel as a high-speed steel. The spark test[12, 20] is frequently used to do this job, and often accomplishes this purpose. But if the operator is not alert, the spark test can be misleading, as when tungsten is not a main factor and molybdenum is present in large quantities.

Therefore, to separate and identify the more familiar types of high-speed steels, the spot tests for molybdenum, cobalt and chromium should be used as well as the spark test.

Suppose four high-speed steels with typical chemical analyses are spot tested simultaneously. Examples: Nos. 81, 83, 84, and 82 shown on the classification chart.

Three separate spot tests for each element can be run on each high speed steel in practically the same time and the multiple test results are more convincing.

Place two drops of Chromium Solution No. 1 in all depressions of one spot plate. In a second plate

each depression needs two drops of Molybdenum Solution No. 1. On a clean spot on each high-speed steel place two drops of Dissolving Solution No. 1. Watch the reaction to see if all steels react with the same speed. If they do, and the small white bubbles come up rapidly, take sample droplets for the chromium tests immediately, using a regular two-hand sampling technique. Should one or more of the steels react slowly when No. 1 Dissolving Solution is applied, see "Spot Test Sampling of High-Alloy Steels."

Use both dissolving solutions on the steels to obtain samples for the molybdenum tests. Transfer two sample drops from each steel to each spot depression.

This method of using the spot plate instead of the blotter for the molybdenum test does not give a strong color like the blotter for small amounts of the element. Hence two drops of the reacting acids must be taken from the steels to bring out the color. Complete the tests by the regular procedure.

The results of these tests will show that the purple chromium tests are practically all alike, indicating about 4.00% chromium in all four high-speed steels.

The molybdenum tests will show impressive contrasts. Light color will correspond to the 0.50% molybdenum content of steel No. 81. (Rex AAA). Dark color will be obtained for Steels 82 and 83, both of which contain about 4% molybdenum. No color for steel 84 indicates a blank test for molybdenum.

Cobalt tests for these four high-speed steels will give a deep blue spot for Nos. 81, 83, and 84, and a yellow color, or blank test for No. 82.

Where Practical Applications Of Spot Testing Have Been Made

Tractor Axles—Several hundred tractor axles were in process, when the stock, SAE 1045, a straight-carbon, water-hardening steel ran out. A change was made to NE 9445, a low-alloy, oil-hardening steel. When the axles were sent to the furnaces for the first heat-treatment after machining, it was discovered that about 50 axles had no markings to indicate the type of steel used. Oil and water hardening steels had been mixed.

To save material and manhours the mixed axles had to be segregated according to chemical analysis. Conventional methods would mar the machined surfaces, the expense of analysis for each item was too costly. The axles were spot tested four at a time without delay and the results of the analysis used to indicate the kind of heat-treatment required by each axle. Not a single axle failed to meet heat-treatment specifications.

In this case, the nickel test was the only one needed for identification, because presence of low nickel indicated the axle was made of NE 9445 steel.

Bar Stock—Nearly a hundred steel bars in 16 sizes up to 7 in. diam., to be made into splines and gears, were suspected of not being the specified SAE 3140 steel. Each bar was spark tested and a section ground for spot testing. The spark test showed four small sizes to be only mild steel. Spot tests indicated no alloy content. Samples were quenched in oil and water, and the results again proved the absence of alloys.

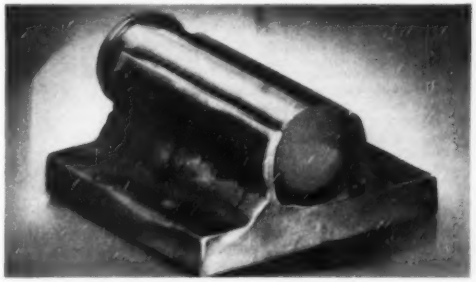
Five bar sizes were found by spot test to contain 0.50-0.60% chromium and about 0.20% molybdenum. The spark test indicated about 0.45% carbon. Later underneath several coats of paint on the bars, markings for a tradenamed steel were found. The spot test had agreed with the typical analysis of the steels.

Seven large bars were spot tested with the following results: Two of the sizes possessed no alloys. Since nearly a ton of steel was involved, a Jominy test was run and the hardenability band developed clearly indicated the steel to be SAE 1040. Had this steel been accepted as SAE 3140 and made into gears, time and money would have been lost.

Spot tests of the last five sizes showed 1.00-1.30% manganese, 0.30-0.60% chromium, 0.20-0.40% nickel, and 0.10-0.20% molybdenum. Jominy tests confirmed these results by hardenability achieved. Gears made from the steel and quenched in oil were of the desired hardness. Hence, the quick, semi-quantitative analysis of the spot test was sufficient to predict heat-treatment and the results.

Track Rollers—Scores of track rollers for crawler-type tractors were to be reconditioned. Work on many rollers had been started in the field. The type of welding rod used was unknown. A spot test revealed that nearly all reconditioned rollers had been properly built up with a self-hardening welding rod; only a few did not meet specifications. A file test gave some indication of hardness, but only the spot test could determine if the alloying elements were present in sufficient quantities to produce a work-hardening surface.

Cultivator Blades—One of two sets of cultivator blades was wearing out faster than the other. Was the better set made of alloy steel? Spark tests indicated both sets were medium-carbon steels of low manganese content. File tests proved that only the



Jominy test bars are conveniently held in this device while surface grinding a strip for hardness testing, and hence hardenability bands are more conveniently obtained by testing along a finished strip

better set had been heat-treated to a desirable hardness. Here, the spot and spark tests were necessary to show that the second set of blades was made of identical steel improperly heat-treated, and not a different steel.

Grinding Balls—The grinding balls in a ball mill developed flat spots in service. Spot testing of the balls demonstrated that the steel contained only a trace of molybdenum, whereas specifications called for a molybdenum steel. The manufacturer then admitted that molybdenum steels were almost unobtainable at the time the balls were manufactured.

Welding Applications—The welder who wants to know the characteristics of welding rods will obtain useful results from spark and spot testing. By laying beads on a 1-in. sq. area of 2x½x2 cold-rolled or mild-steel blocks, the welder gains samples that can be spot and hardness tested. Samples of nationally known welding rods prepared in this way and properly labeled are valuable as standards to spot test simultaneously with unknown welding rods.

Welding rod *X* was represented as being a molybdenum-steel welding rod. The flux was scraped off and the bare wire tested for molybdenum. None was found. Rod *X* was run on a test block of mild steel, later spot tested simultaneously with a known molybdenum steel welding-rod sample. The bead produced by the unknown rod had the same molybdenum content in the weld as the known sample. Therefore the molybdenum was in the flux and not in the rod.

Maintenance Work

Screw Stock—A blacksmith began to repair a chain but found that the rod used for repair links cracked at a red heat. The spot test showed in excess of 1.00% manganese. Thus, the rod was free-cutting screw stock and unsuitable for the purpose because of red shortness.

Air Hammer Plungers—The old chipped plungers were spot tested and the hardness tested. Molybdenum was identified, so a non-deforming, oil hardening steel was used to make the new plungers. Years later the "home made" plungers were still giving good service.

Shot-Gun Firing Pins—Defective firing pins were analyzed with the spot test kit and found to be made of steel that does not respond to heat-treatment. The pins had failed because they were too soft. This quick, inexpensive method of steel analysis told why the pins failed. A non-shrinking, non-deforming, oil-hardening steel was successfully used to make new firing pins.

Author's Acknowledgments

Many persons and organizations assisted the author and maintained his interest through several years of effort in developing the spot-testing procedures in this Special Report. Large and small contributions came from many individuals—machinists, welders, salesmen, blacksmiths, engineers, government officials, university authorities.

The first tests were made in the Remington Arms steel warehouse at Salt Lake City, where the author was given access to steel from stock pile to finished product.

Work on the tests was continued when the author became metallurgist in charge of the metallurgical laboratory and steel warehouse, Redwood Shops, Salt Lake City, for the Sacramento District Corps of Engineers, U.S. Army. Clinton S. Reeder, shop superintendent, took an active interest in the work.

Test results were checked by James R. Long and Tom R. Graham of the Metallurgical Div., U.S. Bureau of Mines, and several of the photographs used herein were supplied by the Bureau.

Valuable assistance was provided by the Caterpillar Tractor Co., Allis-Chalmers Mfg. Co., Bucyrus-Erie Mfg. Co., Le Tourneau Mfg. Co., Lindberg Furnace Co., the International Nickel Co., the Amalgamated Steel Co., and the Atlantic Steel Co.

From the outset of the investigation, Dr. John R. Lewis, University of Utah, promoted the work. Since the author's association with the University, Dean Carl J. Christensen of the College of Mines and Mineral Industries and Dr. J. H. Hamilton, Director of the Utah Engineering Experiment Station, provided the opportunity to continue the investigation, and Prof. Harold R. Bradford, Station Analyst, checked the results.

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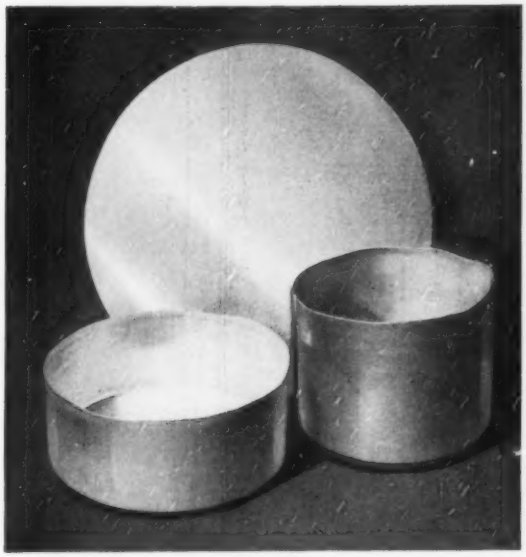
Easy to DEEP DRAW ALUMINUM

Washing-machine tubs are deep drawn at rates of more than 100 an hour from annealed 3S aluminum



BY W. E. HOGE Production Manager, REYNOLDS METALS CO.

MANY manufacturers of domestic washing machines have abandoned the enameled-steel tub in favor of drawn aluminum. Aluminum is not subject to red rust and requires no applied finish except for anodizing, which is simply and rapidly done. There is no need to apply the rather expensive and easily chipped porcelain enamel, as required on steel tubs.

Aluminum is readily drawn and, when production was started, could be had with less delay than steel. Reynolds Metals has large—and increasing—facilities for making the sheet and also put one of its Louisville fabricating shops to work making the tubs in volume for two of the largest makers of washing machines.

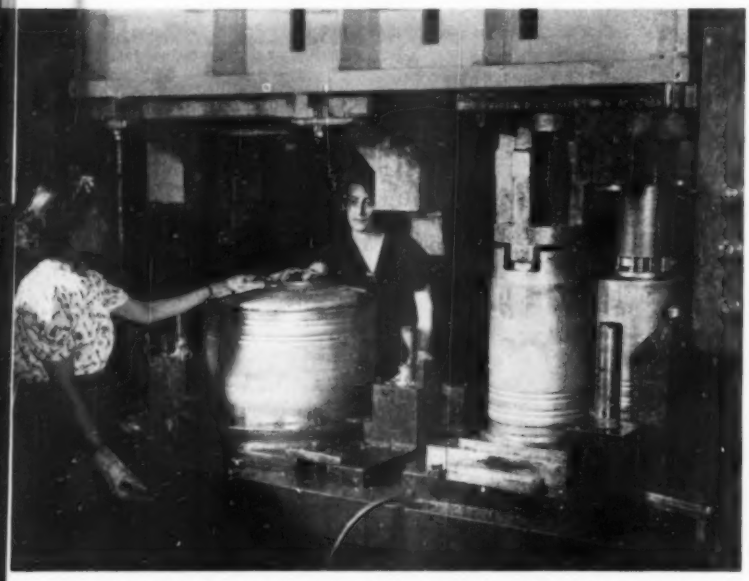
Lubricating and making first draw on the Easy spinner tub in a 250-ton Clearing hydraulic press. One girl puts drawing compound on blanks and a second operates the press—the two together producing 900 to 1000 tubs in an eight-hour shift

Tubs are drawn from 3S-O sheet, 0.064 in. thick, using circular blanks received cut to size. This represents a considerable economy, as the flash remaining from sheets is reused at the mill. Blanks are received with paper interleaves that prevent scratching of their bright, smooth surfaces.

For Easy washing machines, Reynolds makes two sizes of tub, one for washing and a smaller one for spin drying. The larger is produced from a 42⅞-in. blank in two draws, both made at one time in a 1700-ton Clearing press. (Although this press rests on a foundation 32 ft. deep, 26 ft. of it below floor level, the press is so high that it extends above roof trusses in an unusually high bay.)

After paper interleaves are removed blanks are passed to a bench in front of the press where two girls rub Meccadraw 94E in well with synthetic sponges. With

Beads are rolled near the bottom, and open ends are trimmed, in this special machine which handles both sizes of tub. Two vertical shafts carry a chuck over which the appropriate tub is placed. Above each shaft is a rotatable cap supported by a bar pivoted so it can swing aside for loading. While tubs are rotating, air plungers advance the bead and trim rolls. Production is about 600 pairs of tubs in eight hours



Holes are pierced in bottoms and side walls of both large and small Easy tubs in this press setup. Cams operate punches for the side holes. An air-operated ejector lifts the larger tub free of the die

this compound and dies that are highly polished and carefully aligned, the percentage of rejects is held to a minimum.

In the first draw (under the ram center), the blank is converted into a cup 26¾ in. in dia. and 11 in. deep and, in the second draw (at one side), to 22-in. dia. and 18½-in. total depth. This second draw also produces a step 2 in. deep and about 18 in. in diameter at the bottom.

Third Draw Included

Because of the large dimensions and capacity of this press, however, it can accommodate a third die which, in the same stroke, makes a second draw to complete the smaller tub. In this latter draw, a cup 15⅛ in. in diameter and 11 in. deep is converted into a tub 11¼ in. in diameter and 17¾ in. deep. Hence, on each downstroke, this press makes three deeply drawn parts, two of which are being drawn to their final depth.

To handle this production, there are three girl operators. The first girl, at the center, places the blank in the center die. At the same time, the second girl puts a cup in the smallest die for making a spinner tub. The third girl takes a first-draw cup from the center die, puts this in the die at the right for the final draw. She also removes the part after final drawing and passes it to an inspector, who puts accepted tubs in a castered tote box for transfer to the next operation. Girl number two tends only her own die.

In this way, three girls produce an average of about 100 sets of two tubs an hour. They have produced over 900 sets in 8 hours, not including the preparation of the blanks and cups.

Safety of the two outside operators is assured by having two buttons, one at each side of the press, that must be pushed in simultaneously to trip the press. An electric eye protects the center operator, as the press cannot be tripped until she steps well away from the die.

First draw on tubs for the General Electric automatic washing machine is made in this same

Second draw for GE tubs is made in this Bliss press with 375-tons capacity on the inner ram and 175-tons capacity on the outer ram to operate the pressure ring. Operator in the rear loads and unloads the press and operates a trim machine similar to that for Easy tubs. The operator in front presses the trip button. If she needs to reach the dies, she must climb to a spring-supported platform. When this platform is depressed the control circuit is broken and the press cannot be operated. Production is about 500 tubs in eight hours

Narrow flange is rolled at the outer edge of the large Easy tub. Upper forming roll is pressed down by an air-operated lever after the cap on the gate is closed

Nipple is welded to the bottom of the small Easy tub with ⅛-in. flux-coated aluminum welding rod containing 3% silicon

Tubs are anodized in series of twelve 4200-gal. tanks. Racks of 16 tubs are loaded at the far end of the line and handled by an overhead crane

press, but with a different setup. Other operations are shown in the pictures on these pages.

Drawn tubs are delivered by chain conveyor to a Ransohoff cleaning machine. Tubs are fed, bottom up, into this machine on a conveyor that advances them through the washer at 12 fpm. In the first stage, a Diversey No. 519 cleaner at 150 to 160 F. is sprayed from all sides. This cleaner contains from ½ to 1 oz. per gal. of alkali. After cleaning, the tubs are rinsed with water at 100 F. in the second stage and then enter the third zone where air heated to 250 F. dries the tubs.

Contributing much to the success of aluminum tubs is the proper anodizing of all surfaces, both internal and external. Racks have to be made to support the tubs in position to insure contact of all surfaces with the solutions and to permit proper draining before shifting from tank to tank. A typical anodizing schedule is:

(1) Dip in acid etch containing 1 lb. per gal. of water of Frederick Gunn No. 180-K, at room temperature.

(2) Dip rinse in cold water.

(3) Etch 10 to 15 min. in caustic solution containing 6 to 8 oz. per gal. of No. 815 Penn salts and held at 130 to 150 F.

(4) Dip rinse in cold water.

(5) Anodize 15 min. in an 18 to 23% sulfuric acid solution at 70 to 80 F, this solution being recirculated. Current density for this operation ranges from 9 to 12 amp. per sq. ft.

(6) Cold rinse 3 to 5 min. in water that is agitated.

(7) Seal for 15 min. in water heated to 200 to 212 F. The pH of this water is held at 5.5 to 6.5 and the water is agitated.

At present, tubs are wiped dry following the sealing operation but facilities for drying in hot air are being installed. The anodized surface thus produced has a pleasing lustrous gray appearance and provides excellent resistance both to corrosion and to abrasion.

DYNAFLOW CHANGES

Experience in building 50,000 Dynaflow units in 1948 has caused Buick to make several machining changes. Output of the internal planetary gear, made on a 10-spindle Fellows shaper, has been doubled by cutting teeth on one half only . . . All bushings are now precision type, steel-backed bronze but tin-coated inside and *out* (latter for easier insertion) . . . Steel plate on transmission front had a counterbore for front pump seat, copper-plated to seal. Counterbore is now eliminated and dowels locate pump. The steel plate is replaced by a flat CI one which can be ground. CI is self-lubricating, eliminating plating.

Spot weld marks, left, are readily apparent under conventional paints, center, but disappear completely under a single coat of wrinkle paint, right, without any special preparation

Wrinkle Paints Solve Finishing Problems

Decorative, tough, and easily applied, wrinkle finishes cover with a single coat and require a minimum of surface preparation

BY W. A. WALDIE, Technical Director
NEW WRINKLE INC. DAYTON, OHIO

AMONG the popular finishes for industrial, commercial and household articles, wrinkle finishes are constantly finding new fields of application. Their earliest uses were on scientific and photographic equipment but, of recent years, they have been applied to automatic gaging machines, blue printers, oil burners, welding machines and transformers, metal chairs and tables, air conditioning equipment, office furniture and equipment, and a thousand and one other items.

First considered merely as a decorative coating, wrinkle finishes have come to be recognized for other significant characteristics. Remarkable covering power and good adhesion make them economical single-coat materials requiring little or no surface preparation and they provide a dense, hard surface with excellent wear resistance. The texture is non-reflective, easy on the eyes, and affords a non-slip grip to articles which must be handled.

Because of these unusual characteristics there have arisen a number of misconceptions as to the ease with which wrinkle finishes may be applied and baked, the patterns that can be obtained, and the ease of cleaning.

As far as application is concerned, the process is no more difficult than with other paints or enamels. Brushing is not recommended because the surface skin of wrinkle finishes forms rapidly; brushing tends to break this skin and prevents uniformity of texture. Either dip, knife, roller or spray coating may be used, with the latter preferred. Because of the materials entering into their composition, wrinkle paints show a somewhat greater tendency to skin over in open containers than do conventional paints, and it is advisable to purchase the material in container sizes relative to use, so they need not be opened and reopened too frequently. As with other finishes, the tank should be clean and free of hardened paint particles or drops of jellied oil. If these are allowed to pass through the spray gun and reach the surface of the work, a blob will occur which will deform the texture of the wrinkle.

The paint should be properly agitated before painting starts, and thereafter stirred at intervals of about 3 hr. A fine fluid tip and multiple-jet air cap will yield best results. Precise settings will vary with the paint formulation but, in general, about 10-15 psi. air pressure at the tank is recommended, for suction cups, about 50-60 psi., with atomizing pressure at 40-50 psi. Wrinkle should be sprayed somewhat heavier than other materials, and its temperature should not be under 70 F.; if cold, it will not atomize properly, resulting in overloading and sagging. Over-heating, on the other hand, may lead to skinning in the tank and driving off the necessary thinner. Spraying technique should follow conventional lines, with recesses sprayed first to avoid applying an excess of material on well-exposed areas.

Electrostatic spraying may also be used. This method requires a very low viscosity for application, and a special formulation should be obtained from the supplier. Random addition of thinners to wrinkle finishes may prevent wrinkle formation, and should be avoided.

Baking Procedure

As presently formulated, wrinkle finishes are designed for baking, although under certain conditions air drying can be performed. When air drying is used, the finish will have all the characteristics of a baked finish, except hardness. This, however, can be improved by forced-air drying with a moderate amount of heat, and if the work is exposed in

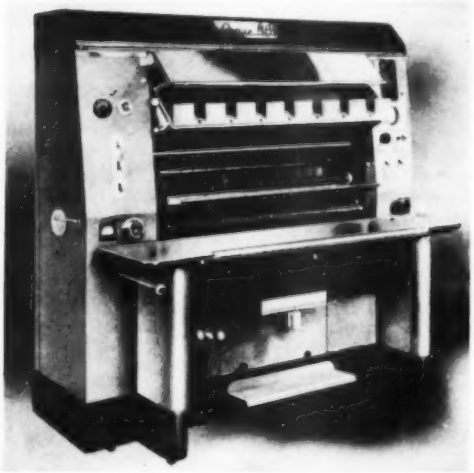
a drying room at 100 F. for 12 to 16 hr., the results will usually be entirely satisfactory. Straight air-drying types are now under development for applications where a baked degree of hardness is not a requisite.

When baking facilities are available, the work should be allowed to stand until the surface is tack-free. This gives the top film an opportunity to form and insures a more uniform texture. Where less than perfect finish is permissible, the work may pass directly to the oven. Any type of oven and any method of firing can be used. Convected-heat baking temperatures range from 150 to 400 F. Precise schedules are supplied with each formulation, but, in general, baking at 150 F. takes from 12 to 15 hr., at 250 F. approximately 1 hr., at 300 F. approximately ¾ hr., and at 350 to 400 F., about 30 min.

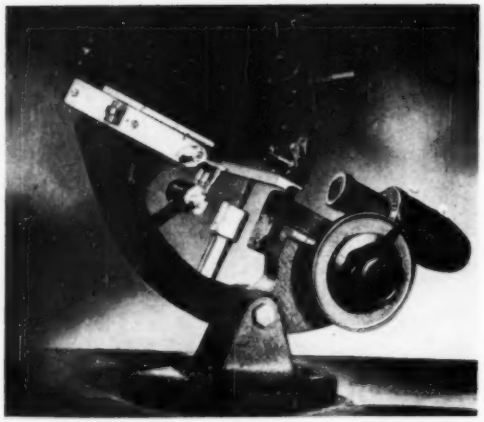
Radiant heat from infra-red sources is considerably faster, but presents special problems because heat flow and surface temperatures of the work cannot always be accurately predicted. It is better, therefore, to make trial runs to determine the most satisfactory heat source arrangement and baking period, or to use a thermocouple to determine the actual heat input to the coating and then maintain the optimum time-temperature cycle in production.

All wrinkle finishes are not alike, and the hardness attained depends on the particular formulation used, which may produce full flexibility or extreme hardness, as required. The manufacturer's recommendations should, therefore, be closely followed.

Wrinkle finishes are not confined to metal products; wood, cloth, wall board, fiber, and even paper can be coated with complete success, provided material of the correct formulation is used and proper care is taken in baking. A bake of 2 hr. at 150 F. is recommended for wood, but if this is not practicable, air drying at 100 F. for 12 to 16 hr. will give satisfactory results.



Hard-wearing qualities and resistance to abrasion, combined with low finishing costs and a minimum of surface preparation, led to the adoption of wrinkle finishes on large pieces of equipment



Scientific instruments and photographic equipment were among the first applications of wrinkle. Non-slip and non-glare characteristics make it admirably suited for these purposes

Patterns Available

As with hardness, the pattern developed depends essentially on the formulation, and it is useless to attempt to match the pattern obtained with one type with that obtained with a different type. Some variations, however, can be introduced by varying the baking time and temperature and by regulating the atmosphere in the oven, but these are difficult to control. Pattern size or texture will increase as a heavier film of wrinkle is applied. Optimum results are obtained by using a paint of the correct formulation to produce the desired pattern, and baking at the recommended time and temperature.

The degree of wrinkle, or pattern, can vary from an extremely fine, satin-like surface to a heavy coarse sag appearance in which the paint literally hangs in festoons. In between are differing degrees of fineness and a novel effect known as "pine tree" finish in which the appearance is produced of looking down at a dense pine forest in miniature.

Any pattern can be produced in a wide range of colors and with varying degrees of gloss, and highly decorative effects can be obtained by over-spraying with a different color to create an unusually attractive veiling or spatter effect.

Surface Preparation

One of the outstanding characteristics of wrinkle finishes is their ability to conceal surface defects on the work. This is particularly advantageous in the coating of welded assemblies, where it is no longer necessary to grind welds down to full smoothness. Spot welds need no preparation; the marks disappear under a single coat of the paint.

About the only surface preparation necessary in most cases is the removal of grease, rust and foreign matter. Scratches, pits and other surface defects may be overlooked, as they will not be visible after the paint has been dried.

No primer or undercoat is necessary. The paint adheres extremely well to the bare metal, and although a prime coat can be applied if desired, tests indicate that results are usually better without the prime. The exception to this is in the case of wood, where a filler is needed to prevent absorption into the pores. This filler can be the ordinary paste material, or a faster-drying, synthetic-base, primer surfacer.

Although wrinkle-coated surfaces are highly resistant to abrasion, it is sometimes necessary to retouch surfaces that have been damaged by rough handling. This can be done, after feather-edging the blemish, with a spray gun or small brush, after which a portable infra-red lamp will be sufficient to dry the surface so it is indistinguishable from the original even under the very closest examination.

Charges are sometimes made that wrinkle finishes are dirt catchers. Actually, they show the dirt less than smooth surfaces, and thus, frequently, no attention is given them until the accumulation has become considerable. They can be wiped clean just as easily as smooth surfaces, and can be waxed if desired to enhance the color tone and improve the ease with which they can be cleaned.

A word of caution is necessary regarding the finishing of assemblies. The wrinkle pattern is affected to some extent by the degree of heat input during baking. Hence, if an assembly is composed of a heavy iron casting, thin sheet brass or aluminum, and perhaps some fiber or wooden parts, it is not reasonable to expect that the entire unit can be painted at one time and baked to a uniform appearance. Uniformity can, however, be obtained by painting the parts before assembly, giving each the time-temperature cycle necessary to produce identical patterns.

FEEL...THE UNKNOWN QUANTITY

OLD-TIME SECRETS have vanished from machine shops, and now apprentices are taught everything —what a lathe looks like, and that micrometers are not precision C-clamps—except the matter of *feel*. Usually the instructor tells a student, "Just work on that simple job for a while until you get the feel of the machine," or, "After you've gotten the feel of the micrometers I'll let you do some precision turning."

This amounts to no advice at all, for the apprentice must find out by himself, with cut-and-try methods, making many mistakes, just what *feel* means and what he is expected to do with the thing, whatever it is.

Actually, *feel* can be demonstrated. It is available to any and all who will consider that *feeling* falls in a triangle with *seeing* and *gravity* as the other two sides. Come and get it!

Take an ordinary pair of calipers and a small steel rod. Set the rod on a table and hold the calipers so the legs straddle the rod and the tips touch the table. Now tighten the legs until they are about the same distance apart as the diameter of the rod. Finally lift the calipers. If the rod lifts with them, loosen the calipers slightly, and if the rod remains on the table, tighten the calipers slightly.

After some adjustment you can set the calipers so that as you lift them, the rod lifts too, but slides back to the table. This means that *gravity* overcomes the lift, but the lift is still *visible*. With *gravity* overcoming *visible* lift, you are in the presence of that great imponderable, *feel*.

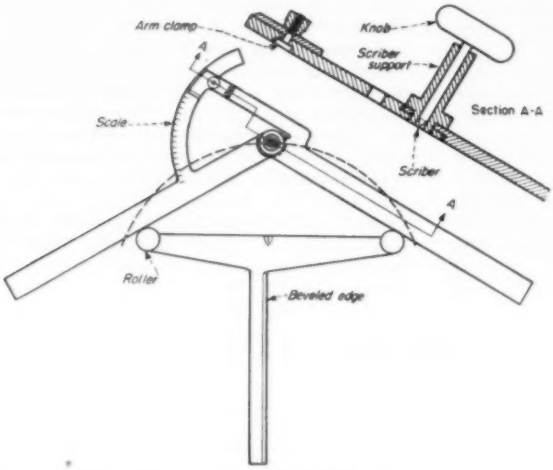
The correct *feel* can now be defined as that sliding drag you felt after you lifted the rod and it started sliding back down to the table. This effect can be illustrated on a heavy bar. Take a large pair of calipers, set them astraddle the bar, and open them until they slide, by their own weight, past the largest dimension. The sliding motion should be slow, but enough to be visible.

With enough practice, a student can learn to measure within 0.005 in., or even 0.001 in. He must remember that the caliper must be held perpendicular to the surfaces being measured, because sloppiness can make the reading on any gage worthless.

Practice is the thing that develops machine-shop feel, but these suggestions may help develop that skill in a faster and less painful manner. *Charles Shope, Washington, D. C.*

"—Another negative for the proposed change in shifts."

Practical Ideas



Scriber Marks Arcs Without Center Location

SHORT ARCS of large circles are scribed on metal parts, primarily on gas-turbine ducts, with this device. Many shop men may find it useful for other kinds of layout work where accuracy is required and a center for a compass cannot be located. The device is located from a vertical diameter of the circle and a known point on the circumference.

Sawed from lengths of mild-steel flat stock, the two parts were welded together and hand-finished. The T-section was made with two rollers permanently fixed (brazed) at the ends of the horizontal leg with their centers exactly 10 in. apart. This location, as well as having the rollers at the same height, was important. The beveled edge of the vertical member was centered between the rollers and a scribed line was marked along the top of the T in line with the edge.

The angle component was pivoted at the scriber support. This support, the scriber and the arm clamp were machined, and the knob was a handy plastic one. The joint was lapped for accuracy, and the bottom of the support was peened over for permanent holding power.

Once the scale was marked, no further work was necessary. Each desired radius was marked after its angle (between the legs of the angle member) was marked. The angles were found by deducting an inch, which was the total of the roller radius plus half the thickness of either arm, from the required radius and substituting this quantity for R in the equation:

$$\text{Tangent of the angle} = \frac{5}{R - \sqrt{R^2 - 5^2}}$$

This calculation was necessary for each radius marked on the scale, but had to be done only once. The angles were set with an accurate protractor, and the corresponding radii were scribed on the scale.

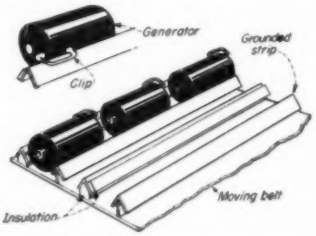
With the radius set, the T is set on a diameter and the angle piece set to contact the rollers. As this is rocked back and forth the scriber marks a line of the required radius. *Clifford T. Bower, Decatur, Ga.*

Broken Punch Acts as Drill

THE HIGH-CARBON STEEL in small piercing and cutting punches is generally of good enough quality that broken punches should be put to some secondary use.

One idea is to grind down a single point or cutting edge and use a broken punch as a drill or reamer. The single-edge tool is good for holes in plastics, soft metals and mild steel.

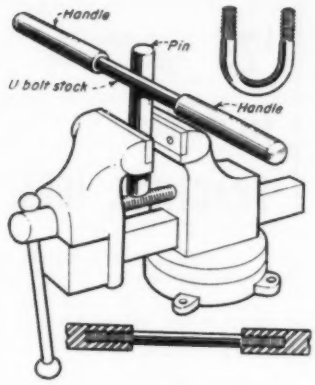
Another idea is to point the end and fix the old punch in a suitable holder. It can then be used for center punching, scribing, and for punching nails, rivets and pins. *Federico Strasser, Santiago de Chile.*



Hot Angle Iron on Conveyor Makes Generator Test

AUTOMOBILE GENERATORS are tested by one manufacturer as they move along a flexible-belt conveyor toward final-inspection stations. Insulating strips support two angle-iron lengths for each row of three generators. One angle iron supports the generator directly, but the other, a "hot" iron that carries six volts, has another insulating strip fastened to it on which the generator rides.

Wire clips on the generator terminals jump the insulating strips, and power the generators so they run as motors. Faulty connections or wiring are indicated immediately by this "run-in" test. The non-insulated angle acts as a ground connection. *Chester S. Ricker, Grosse Point, Mich.*



U-Bolts Bent Without Damaging Threads

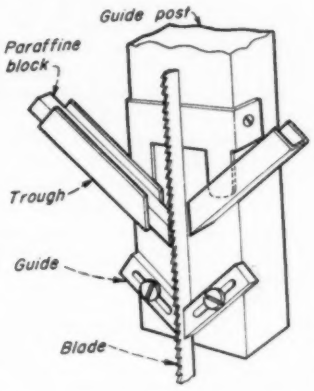
BENDING HANDLES, turned and threaded in stock from ⅛-in.-dia. stock up, can be made for bending rods that are threaded on one or both ends without stripping or mashing the threads. They are made about 8 or 10 in. long with the holes drilled about 2 in. deep.

The stud to be bent is threaded into two handles, or one if only one end is threaded, and bent around an upright pin or bar clamped in a bench vise. The handles make the bending easier, in addition to protecting the threads. *Dennis D. Unruh, New Orleans, La.*

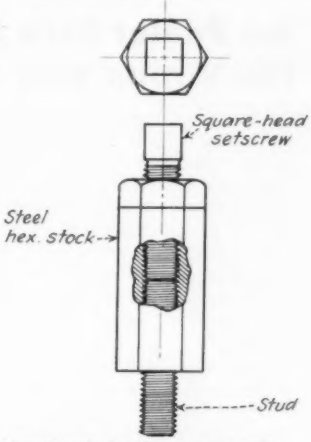
Paraffine Lubricates Bandsaw

ORDINARY PARAFFINE — the kind housewives use to seal canning jars —lubricates a bandsaw in a simple feeding mechanism. A block of paraffine is cut up into strips to fit into two troughs.

The troughs are soldered at a 45° angle to a sheet-metal clamp screwed to the guide post of the saw. These are placed an inch or two above the regular saw guides.

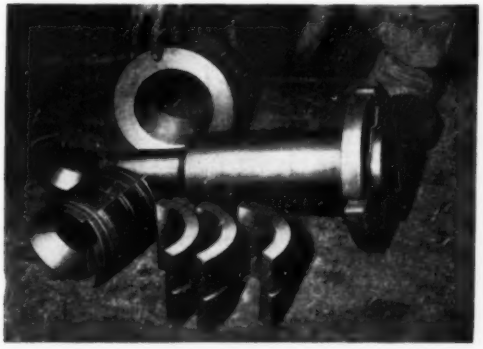


Gravity feeds the paraffine into the blade from the troughs, which are about 3 in. long and ½ in. square. The effect is that the heat of the blade, while cutting, melts the paraffine slowly enough to cover it lightly and evenly. Actual tests have shown that this increases cutting speeds, and blade life is increased. In addition, galling at the blade guides is eliminated. *Thomas Patell, Camillus, N. Y.*



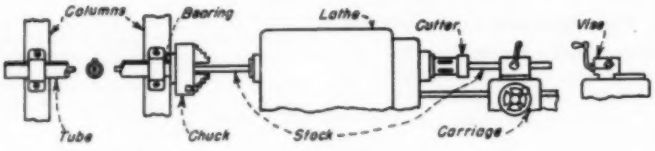
Hex-Stock Tool Drives Studs

THE DRAWING shows a stud driver, setter and puller that has proven more practical and serviceable than any others I have seen. A set in numerous sizes can be made at little expense from scraps and materials found in any shop. They should be a valuable addition to any tool box. *Harold A. Walker, Denver, Col.*



Heavy 8-in.-dia. bronze bushings for railroad-engine side rods are turned as they are held by a three-section collet on an expanding mandrel. Sections fit against 45° chamfer on mandrel and are expanded by chamfered collar forced against them by large nut and washer

Assembled collet is supported in lathe faceplate by tailstock center nesting in centerdrilled end of mandrel. Variable diameter of collet compensates for variations in inside diameter of cast bushings, which are turned by standard high-speed-steel cutting tool. *Walter Rudolph, Erie, Pa.*



Bar Peeler Runs Stock The Wrong Way

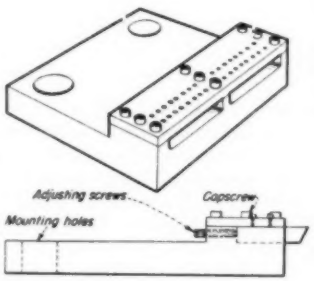
PEELING OPERATIONS on Inconel-X round stock up to 2-in. diameter are performed on a 24-in. engine lathe that reverses a lathe's normal functions. Instead of rotating the stock in a chuck and turning with a fixed tool on the saddle, this machine feeds the stock, but does not allow it to rotate, and the cutters revolve under headstock power.

Stock feed is provided by the carriage and a vise that clamps the work in one position. This allows a large range of feeds for different sizes of stock. A multiple-tool cutter or peeling head mounted in the headstock turns off the skin of the metal as the bar feeds through it.

Continuous running is made possible by a feed tube mounted in two sleeve bearings on building columns behind and in line with the lathe spindle. The tube itself is provided with an external lengthwise key that engages with slots in the bearings. This prevents rotation of the tube and of the small lathe chuck fixed to its end near the engine lathe.

As stock feeds through the cutting head it feeds into the tube. When the bar is about 9 in. from completion, the chuck and tube are pulled up to the lathe and the chuck is clamped on the stock. Then the carriage is moved back toward the tailstock and a new bar is loaded through a steadyrest (not shown) and clamped in the vise. Feed power is again applied and the new stock pushes the old bar through the cutters as the chuck is pushed toward the bearings. This keeps the old bar centered and supported until after the new bar is being cut and the chuck can be unclamped. The old bar is removed and operations proceed as before.

Stock is peeled with this setup at a rate up to 200 ft. per hour, with little time lost for setting up new stock. Since the chuck can be moved up to the end of the lathe and clamped while the stock is still feeding, the only time lost occurs when the operator unclamps the vise, moves it toward the tailstock, and clamps it on a new bar. *International Nickel Co., Huntington, W. Va.*



Toolblock Takes Sixteen Bits

HOGGING CUTS on Inconel X to remove oxide are made with a toolholder that clamps 16 Rexalloy Red Arrow bits. Each of the ⅝-in. square bits takes a 1/16-in. cut—and each is held in place by two setscrews through a top plate.

The main block holds the bits in two sections of 8 bits each. Two large holes in the block permit it to be bolted to the cross-slide of a lathe to replace the compound. Once set up, the block is fitted with toolbits which are adjustable in depth of cut by Allenhead setscrews in tapped holes through the back section of the block. *International Nickel Co., Huntington, W. Va.*

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

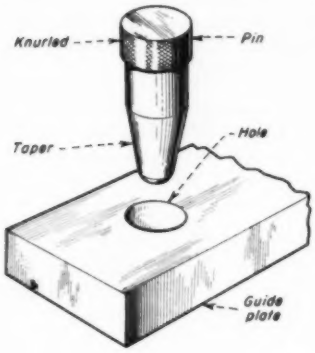
HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

70TH WINNER:

LOWELL F. STULL
Shift Bar Controls
Floating Punches

Counterbore Drills Thin Sheets

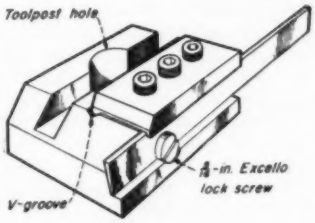
THIN PLASTIC and sheet metal cannot be easily drilled by ordinary methods, but a counterbore can do a good job. The sheet is first drilled through with a drill the size of the counterbore pilot. This may produce a ragged hole, but that is unimportant. The counterbore is then mounted and inserted in the hole, and fed through. The hole produced is clean and perfect. *Bernard Levowich, Brookline, Mass.*



Guide and Pin Center Tap

SCREWS THAT ARE frequently replaced require fully tapped holes, while those that are permanent are tapped only to partial radial depth. For a job that involved mixed types, holes were drilled with diameters from 13/32 in. to 29/64 in.

Despite variations in diameter, all the holes had to be tapped with the tap centered concentric with the axis of the holes. To do this, the illustrated tapping guide and pin was designed. The pin has a 3 in. per ft. taper from a large diameter of 0.0506 in. It is fitted in the 0.508-in. hole in the guide, a flat plate, and dropped in a hole. Because of the taper, it centers at some depth with the hole edge on the tapered section. Any variation in hole diameter simply changes the height of the pin, but has no effect on the centering. Once centered, the guide plate is clamped, the pin removed, and tapping takes place. *Martin H. Ball, Watervliet, N. Y.*

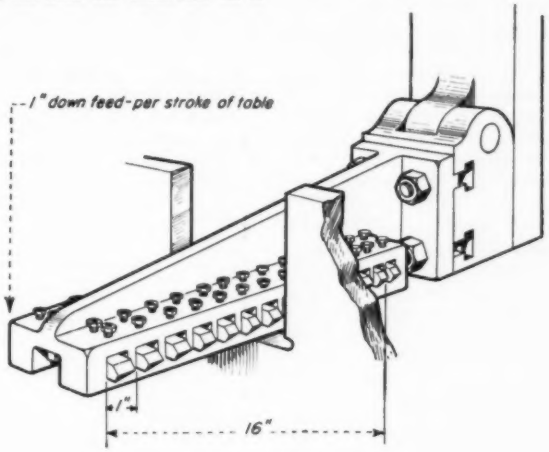


Cutoff Block Gets Close to Chuck

THIS TOOLHOLDER has two purposes. It holds a cutoff tool, and also can be employed for holding a conventional toolpost and bit.

The block was machined with a 1⅜-in.-hole for insertion of a toolpost, which is used with the block turned 180° from the position in which the cutoff tool is employed. The toolpost normally holds the whole block in place on the slide, with a blank tool catching in the slot.

A V-groove in the top of the block forces the top plate toward the post when the three setscrews are clamped. This holds the parting tool tightly. For this purpose the setscrew holes in the plate were drilled oversize. One advantage of the block is that it can be used quite close to the chuck without being hit by the rotating jaws. *Dwight R. Page, Wellington, O.*



Broach-Like Planing Tool Slots Thin Plate

TO COMBINE cutting power, speed and accuracy and to allow little vibration or distortion during the operation, a special planing toolholder was devised for cutting a slot in large machine-frame parts. The top and bottom of the slot in the part illustrated were planed in the conventional way, but the special tooling setup handled the vertical sides of the slot.

The plate was ⅞ in. thick, so the 16 toolbits (⅝ in. square) on each side of the long tongue were spaced along at 1 in. intervals. The down feed of the clapper box was set at 1 in. per stroke. Since each bit was dropped 1/16 in. from the one in front of it, this made the effective cut for each bit only 1/16 in.

Action of the combined toolbits, which cut both sides of the slot at the same time, is much like a broach. This setup eliminated the disadvantages of a short stroke and reduced working time to a small fraction of what it would have been with a single-point tool in an extension holder. *G. R. Milner, Gainsborough, England.*

Plenty 27 Threads

REFERRING to the article, "No 27 Threads" by Jack Everett, it is possible to cut 27 threads per inch on a modern quick-change-gear lathe—and many other special threads can be cut—if the lathe is adapted slightly.

A temporary replacement of the gear at the left side of the gear box (on a 9-in. South Bend, for example) will do the trick. This gear normally has 56 teeth. When the box is set at B-8, the lathe will cut 28 tpi. However, if the gear is changed to one with 54 teeth, the whole gear-box relationship will be changed, and with the box still set at B-8 the lathe will cut 27 tpi.

The same thing can be done to most lathes, although the gears may have different numbers of teeth. The replacement gear can be chosen by multiplying the number of tpi. desired by the number of teeth in the original gear, all divided by the number of tpi. normally cut at that setting of the gear box. Of course the result must be a whole number of teeth, but with the large choice of gear settings possible on modern lathes, the figures can be juggled around for almost any unusual number of threads per inch. *William R. Baker, East Liverpool, O.*

Besides—'Tain't So!

AFTER READING this (letter by Jack Everett) I stepped out into our shop and found 5 modern lathes equipped for cutting 27 threads per inch:

1. Rivett 608 PV bench lathe
2. 10-in. Monarch Model EE toolmaker's lathe
3. 12-in. Model C Pratt & Whitney engine lathe
4. 14-in. Monarch engine lathe
5. 16-in. Model C Pratt & Whitney engine lathe

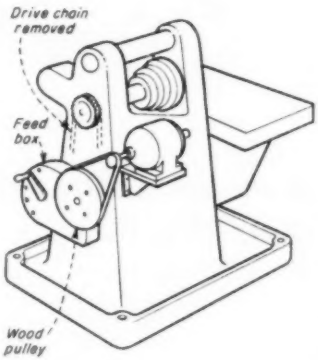
I suggest that Mr. Everett leave tool and gage making to shops that are properly equipped and that he should do a little more studying before condemning the manufacturers of modern engine lathes. *R. E. Moulton, Sup't, Experimental Fabrication Dep't, California Institute of Technology.*

And Furthermore . . . . . .

MAY WE ADD our comments to those of Jack Everett on No. 27 threads. Mr. Everett is concerned with the standard 27 thread for ⅛-in. pipe, but that standard goes much farther. It has always been the standard gas thread and we in the gas-appliance industry would be completely thrown for a loss if the standard was changed.

We use No. 27 threads in all applications, whether ⅛-in. taper pipe or 15/16-in. straight, and are compelled to continue to do so because of the hundreds of thousands of appliances now in service that use that standard. If the standard were to be changed we would still have to supply replacement parts in 27 thread, and the serviceman would be hard put to determine the difference between 27 and 28 while on the job.

The answer is that makers of lathes and screw machines must incorporate means of cutting this standard thread on their machines. It is surely not impossible because, as Mr. Everett pointed out, older machines are so equipped. *D. W. Hartzell, Cleveland, O.*

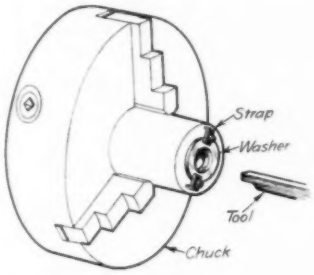


Auxiliary Motor Drives Milling-Machine Table

WE RECENTLY moved into another town where the available current supply did not allow us to operate the spindle-driving motor of our No. 2 Kempsmith plain miller. Since our work is usually small, and we already had installed a Bridgeport head on the machine for milling, we did not have to convert the motor or buy a new one.

Table feeds, though, were necessary. A ½-hp. motor installed on a shelf at the side of the machine frame handled these feeds. A 10-in. wooden pulley was mounted on the feedbox to drive the table, and power was provided from the motor to the pulley by a V belt.

This method reduces power wastage that we would have had if the regular miller motor had been employed solely for table feeds. *E. L. Wesdal, S-M-T Corp., Glastonbury, Conn.*



Engine-Lathe Fixture Holds Washers for Boring

THE ILLUSTRATED fixture shows what can be done on a lathe for a hurry-up job. A rush order of 300 washers came into our shop with the holes ⅛ in. undersize and with the chamfers missing.

Two holes for the straps were drilled and tapped in a piece of cold-rolled bar stock, and the stock was chucked in the lathe. It stayed there until the job was done. The center hole was drilled for tool clearance, a counterbore was cut about half as deep as the washer thickness, and two straps, bent over at one end, were assembled with socket-head screws.

The tool, a ⅝-in. high-speed-steel bit, was ground with a 30° chamfer angle and with a straight section for the new hole diameter, and was clamped in a toolpost. The whole job was done in a minimum of time with little expense for the setup. *Roger Isetts, Kenosha, Wis.*

"Give us the tools . . ."

McGraw-Hill Surveys BUSINESS NEEDS

If it can get the money American industry in 1949 will go full steam ahead with a vitally-needed program of improving its facilities. This program since V-J Day has kept business expanding and has made belated headway in modernizing industry.

Furthermore, if it can get the money American industry will carry on for the next five years with its unprecedented program of expenditure for new plant and equipment. Plans already made call for spending about $55 billion.

These are findings of the McGraw-Hill national survey of "Business' Needs for New Plants and Equipment." Major results of the survey, which have been rechecked since election day, are summarized on the following page. They report what American industry is now planning to spend for new plant and equipment. *They do not and cannot show what will be done if the plans are hamstrung by political action.*

In 1949, the survey shows, American industry plans to spend $14.1 billion for new plants and equipment. That is only about 5% less than was actually spent in 1948.

If these plans are carried out, actual capital expenditures this year may be somewhat larger than they were in 1948. That is because expenditures usually prove to be larger than planned.

Fulfillment of American industry's plans for investment in new plant and equipment this year would no doubt mean a continuation of general prosperity. The record shows that when capital expenditures are high general business thrives.

Even more remarkable than the 1949 prospect is the fact that:

Industry already plans to spend $41 billion in the years 1950-53 to improve its plants and equipment.

Plans tend to taper off, of course, as they are pushed further into the uncertain future, five years from now. But the striking fact is that plans for expenditures so far ahead are as great as they are. They show American industry's need for tremendous improvements in its plants and equipment.

Again, let there be no mistake. These survey findings are not a five-year forecast. They report what leading corporations now are planning to do — *if they can get the money.*

But — won't industry be top-heavy with plants and equipment if it carries through any such program?

The answer is clearly — "No".

Here are some of the reasons why not that were disclosed by the McGraw-Hill survey:

First, manufacturing industries are shifting emphasis from expansion to improving efficiency.

They have increased their total capacity 56% since 1939. Their expenditures in 1948 went almost 50-50 for expansion and improvement. But in the next five years they plan to spend three-quarters of their funds to replace and modernize facilities, only one-quarter for expansion.

Second, the prospective rate of expenditure for new plant and equipment is relatively low.

Planned expenditures for new plant and equipment in 1949 represent about 7.5% of the present value of all plant and equipment. That rate of capital expenditure is no higher than the rate during previous periods of prosperity. And industry must overcome years of starvation for new equipment, caused first by the depression of the 30's, then by diversion to war production.

Third, industry is following an extremely cautious policy in buying new equipment.

Three out of four companies report that they will not buy equipment unless it will pay for itself within five years. And a third of the companies report that they expect new equipment to pay for itself within three years. The reason most frequently given for such expectations was that all the money available can be spent on equipment which does pay for itself quickly.

The program of capital expenditure planned by American industry is one of the greatest bargains ever offered to the American people.

To pay for itself in a few years, as equipment must if most companies are to consider buying it, that equipment

continued on next page

WHAT THE SURVEY SHOWS

● HERE ARE THE MAJOR FINDINGS of McGraw-Hill's survey of "Business' Needs for New Plants and Equipment". Rechecked since Election Day, results show what industry is now *planning* to spend for new plants and equipment. They do not forecast what will actually be spent. The survey shows:

1. Industry now plans to spend $14.1 billion in 1949 – and almost $41 billion in the four years beyond, 1950-53.
2. Manufacturing industries alone plan to spend $7.2 billion in 1949. This is 7.5% of the estimated value – $96 billion – of all manufacturing facilities.
3. Manufacturers estimate conservatively that it would cost $136 billion to completely replace their facilities with the most modern plants and equipment available.
4. Postwar expansion is virtually complete in most manufacturing lines. Major exceptions: steel and petroleum refining.
5. Expansion programs of railroads, utilities, and oil companies still have two to five years to run.
6. Manufacturing industries have increased their capacity 56% since 1939. But expansion is slowing down. Increase planned in the next five years is only 13%.
7. Efficiency is emphasized more and more in planning new facilities. Manufacturers plan to devote almost three-quarters of their funds to replace and modernize. In 1948, 58% went to increase efficiency this way.
8. Equipment should pay for itself in five years or less, say three out of four manufacturing companies. New buildings, say 77% of them, should pay out in 15 years or less.
9. Profits and reserves are counted on to pay for new buildings and equipment by three out of four manufacturing companies. Some 15% expect to borrow, only 9% plan to sell stock. However, 20% would like to sell stock, only 4% want to borrow.
10. More liberal depreciation allowances for income tax purposes would prompt almost two-thirds of the companies to speed their purchase of new plants and equipment.

● A copy of a complete report on "Business' Needs for New Plants and Equipment" may be obtained by writing me at McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

must promise to produce much better products or make great savings in labor and material. The savings go first to the companies buying the equipment but, as they always have, they soon spread to everyone in the form of better products at lower costs.

Where does industry expect to get the money to buy this bargain for the American people?

Most of the companies covered by the McGraw-Hill survey (76% of the total) count on their own resources – largely profits – to pay for new plant and equipment. About 15% of them expect to borrow money, although only 4% like the idea of getting saddled with fixed debt. Only 9% of the companies expect to sell stock to investors, although twice that many report they wish they could.

What are the chances that business can get the money?

The survey provides no answer to that question. No survey can.

The answer will come from Washington – in what Congress does about taxes on profits and taxes on the millions of Americans who might invest a part of their income in industry's new plants and equipment.

The answer will be found also in the energy and skill shown by investment bankers, particularly in mobilizing the resources of the millions of Americans whose incomes have increased enough since 1940 to make them potential direct investors in industry.

Still another important part of the answer will be given by labor leaders. About half the companies surveyed by McGraw-Hill are holding back on new construction – primarily because of high costs. What organized labor does about wages and productivity can swell or shrink that percentage.

The McGraw-Hill survey leaves no doubt that American industry is fulfilling its responsibility. It is planning the capital improvements needed to make the nation secure, prosperous, and progressive.

But business today lacks confidence and badly needs added incentives. Proper taxation and increased depreciation allowances are vital if we are to open the capital markets to finance industry.

What will happen now depends in large part on what is done in Washington. In his State of the Union message, the President said that "business should plan for steady, vigorous expansion." But in his budget message he proposed new taxes which would divert a substantial share of the money industry is using for expansion and improvement. Moreover, he said nothing about the vital issues now freezing the capital markets.

It is not possible to have it both ways. Fulfillment of the President's tax program means cutting industry's program for new and better equipment. It means slowing down industrial progress. It means delaying the advance toward much higher standards of living tomorrow in order to have a little more government spending today.

I urge you to see that your Representative and your Senator have all the facts on industry's needs for new plant and equipment. What they do to this program will have a decisive bearing on the nation's security and welfare.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This is the fourth editorial of a special series on industry's needs for new plants and equipment – and what these needs mean to all Americans.

NEWS OF METALWORKING

No Assurance Yet that North Atlantic Pact Will Stimulate Armament Program

WASHINGTON—Of itself, the North Atlantic security pact won't stimulate our armament program. It's the complementary program of military lend-lease that would do that job. However, details of the so-called lend-lease program are being kept under wraps—partly because they haven't all been worked out as yet.

The administration is pushing, first, the security pact. Once that clears Congress it will concentrate on arms aid. As a judgment, it will be many weeks before this hits Congress. The later it gets there, the less inclined will Congress be to vote the currently talked of $1- to $2-billion of arms aid. Barring an international crisis, informed opinion here is that the request may total $750-million or $1-billion as a starter.

May Transfer Present Equipment

Even at that, much depends on the composition of aid to be sent Western Europe. To make the point, cloth for uniforms wouldn't interest our heavy industries, but tanks and guns would. Also, the program may involve transferring some of our existing armament—including surplus.

Generally speaking, we have plenty of field artillery in excess of needs—especially towed 105's and the ammunition for them. We probably have some excess light and heavy machine guns, too; also, some Springfield rifles and numerous carbines and tommy guns. The U. S. could supply some excess Sherman tanks and maybe a number of propeller-driven fighters, fighter bombers, light bombers, and attack planes of wartime designs; likewise for light naval craft up to destroyer size.

But, unless the U. S. produces it, we can't supply the automotive or transport equipment, engineering equipment, and a great deal of other items.

In other words, we cannot now—and cannot in the near future—supply Western Europe with all the balanced equipment needs, unless we launch a big manufacturing program. That would take a number of years and many billions of dollars. One figure mentioned for a five-year full-dress program comes to almost $10-billion.

German Products Show

Germany's industrial products will be shown in this country for the first time since the war in an exhibition opening April 9 at New York's Museum of Science and Industry.

$55 Million in ECA Tools

WASHINGTON—ECA figures Marshall Plan countries will have bought upwards of $55-million in machine tools by the end of this fiscal year. What's more they expect Western Europe's ECA machine tool needs from U.S. sources to approach $75-million in fiscal 1949-1950.

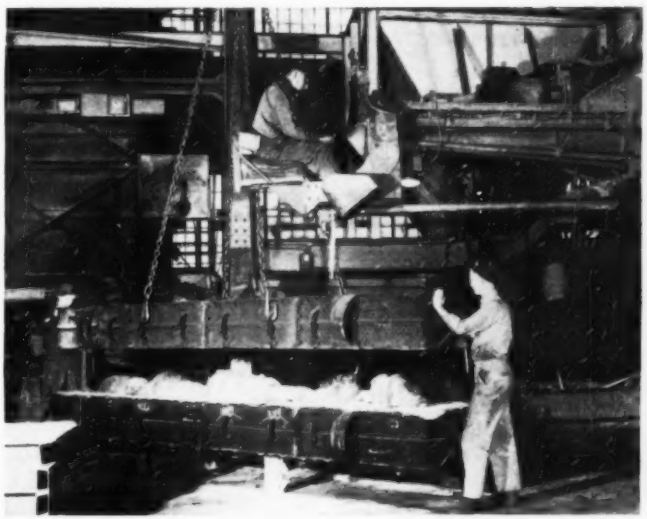
Until early fall most of ECA's money went for pure relief items—food, fuel, and fertilizer. For the first time on Nov. 15, procurement authorizations of machinery and equipment exceeded those for food and agriculture.

Projected figures indicate that by the end of this fiscal year total ECA dollars authorized for machinery and equipment, including transportation items, will hit $850-million.

Cutting Tool Group Elects New Officers

Emil Gairing, president of Gairing Tool Co., Detroit, was elected president of the Cutting Tool Manufacturers' Association at the fifth annual membership meeting, held in Detroit.

Other officers named were Norman Lawton, works manager, Star Cutter Co., Detroit, vice president; R. S. Spencer, president of Detroit Boring Bar Co., treasurer. Harry J. Merrick continues as executive secretary of the C.T.M.A.



***WORKMEN** at Pacific Car & Foundry Co. plant, Renton, Wash., place cope half of flash over pattern to complete mold for crankshafts to be used in heavy-duty diesel engines. Perfecting of casting process followed development of new nickel-molybdenum iron, Carcoloy, which could be produced in an electric furnace and meet tensile and other strength requirements required of crankshafts. The shafts are used in diesel engines of from 5 to 12 cylinders and from 450 to 2,400 hp.*

INDEX OF MILITARY PURCHASING OFFICES

To sell to the Army, Navy, or Air Force any of the products listed below, get in touch with the military purchasing office cross-indexed to the item you have for sale. Boldface letters and numbers given after the items indicate the key to purchasing offices, cross-indexed to the right in the third column.

Aircraft Parts and Equipment

Aircraft engines, propellers, and frames—**AF-1, N-1, N-7**
Lifeboats, rigid, air-borne—**AF-1**

Cutlery and Hand Tools

Edge tools, files, rasps, and saws—**N-6**
Hand tools—**N-6**
Kitchen utensils, tools, and cutlery and tableware (Except silverware)—**A-4**
Mechanics' measuring tools—**N-6**

Construction, Mining

Construction: mining and excavating equipment (Mining machinery, rock-drilling and earth boring; power excavators, wheel-mounted; dredging equipment; scrapers; tractors, contractors; loaders; crawler carts—**A-1**
Contractors' jacks (For supporting trench sidewalls, concrete forms, and related uses)—**N-6, N-7**
Graders and maintainers—**N-6, N-7**
Logging equipment—**A-1**
Oil field producing equipment—**N-6**
Power excavators and attachments (Track laying only)—**N-6, N-9**
Road-making machinery:
Bituminous mixing, paving and related equipment—**A-1**
Concrete mixing, paving, placing, and related equipment, including cement handling and placing equipment—**N-6, N-9**
Road and pavement clearing and cleaning equipment, except tractor and truck attachments—**N-6, N-9**
Road and pavement repair, marking, leveling, and demolition equipment—**A-1**
Scaffolding, adjustable and demountable—**A-1**
Stabilizing, compacting, and soil-preparation equipment for roads and streets, except tractor and truck attachments—**A-1**

Ordnance Equipment

Antiaircraft carriages, mounts, and recoils—**A-5**
Artillery carriages, mounts and recoils—**A-6**
Artillery carriages, mounts, recoils, and transport wagons for 8-inch gun and 240 mm. howitzer only—**A-5**
Artillery shells and projectiles—**A-7, N-4**
Bayonets—**A-8**
Bombs, fin assemblies, and subassemblies—**A-9, N-4**
Cartridge clips—**A-8**
Demolition charges—**A-9**
Fire control equipment (Except range indicator and binocular Navy)—**A-7**
Fuzes, mechanical, time and V. T.—**A-7, A-9, N-4**
Guns, howitzers, mortars, and rifles; 20 mm. and above—**A-10**
Hand carts—**A-6**
High explosives, propellents, blasting agents, supplies, and miscellaneous explosives—**N-4**
Launcher, grenade—**A-8**
Launcher, rocket 2.36 and 3.5—**A-6**
Links, metallic belt—Cal. .30, .50, .60—**A-6**
Machine guns, .30 to .50 cal., except air; also .60 cal.; machine gun trainers, mounts, and tripods—**A-6**
Machine guns, .30 to .50 cal. air—**A-8**
Military tanks, armored cars, self-propelled artillery and other armored combat vehicles—**A-11**
Mines, naval and aerial, and components—**N-4**
Navy machine gun mounts for boats—**N-3**
Rockets, mines, signals, grenades, and components—**A-9, N-5**
Scabbards—**A-6**
Small arms ammunition—**A-7**
Small arms (rifles, carbines, submachine guns, pistols, revolvers, and shotguns)—**A-8**

Motor Vehicles

Amphibious military motor vehicles (Except landing vehicles tracked)—**A-11**
Landing vehicles tracked—**N-2**
Passenger carrying vehicles, trucks—**A-11**
Tractors: Earth moving, mining, agriculture (Excludes materials handling)—**A-1**

Railroad Equipment

Railroad construction and maintenance equipment—Power driven—**A-1**
Railroad transportation equipment; except items of special design or peculiar to a particular department—**A-3**
Rolled wheels, axles, track accessories (wrought steel wheels, wheel centers, axles, and tires)—**A-2**

Miscellaneous

Agricultural machinery and implements, including tractors—**A-1**
Domestic water systems (Power operated units) shallow and deep well—**N-6, N-7**
General purpose industrial machinery for crushing, pulverizing, screening, and mixing—**N-6**
Lifeboats, ship-borne—**A-2**

Purchasing Offices

A-1 Chicago Procurement Office, Corps of Engineers, 226 West Jackson Boulevard, Chicago 6, Ill.
A-2 Procurement Division, Marietta Transportation Corps Depot, Marietta, Pa.
A-3 Chief, Supply and Facilities Division, Office, Chief of Transportation, Washington 25, D. C.
A-4 Chicago Quartermaster, Purchasing Office, 1819 West Pershing Road, Chicago 9, Ill.
A-5 Watertown Arsenal, Watertown 72, Mass.
A-6 Rock Island Arsenal, Rock Island, Ill.
A-7 Frankford Arsenal, Philadelphia 37, Pa.
A-8 Springfield Armory, Springfield 1, Mass.
A-9 Picatinny Arsenal, Dover, N. J.
A-10 Watervliet Arsenal, Watervliet, N. Y.
A-11 Detroit Ordnance District, 6301 West Jefferson Avenue, Fort Wayne, Detroit 17, Mich.
N-1 Bureau of Aeronautics, Navy Department, 18th Street and Constitution Avenue, Washingon 25, D. C.
N-2 Bureau of Ships, Navy Department, 18th Street and Constitution Avenue, Washington 25, D. C.
N-3 Pr. 5, Bureau of Ordnance, Navy Department, 18th Street and Constitution Avenue, Washington 25, D. C.
N-4 Pr. 6, Bureau of Ordnance, Navy Department, 18th Street and Constitution Avenue, Washington 25, D. C.
N-5 Naval Aviation Supply Office, Oxford Avenue and Martins Mill Road, Philadelphia 11, Pa.
N-6 Navy Purchasing Office, Navy Department, 18th Street and Constitution Avenue, Washington 25, D. C.
N-7 Navy Purchasing Office, 1206 South Santee Street, Los Angeles 15, Calif.
AF-1 Procurement Division, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio

New Viewpoint in NSRB

WASHINGTON — President Truman's appointment of Mon C. Wallgren as chairman of the National Security Resources Board indicates two things. For mobilization planning, the Board's chief job:

(1) There'll be a hiatus until the new chairman finds out what the job is all about, and then decides what he thinks should be done and (2) There's no question but what the NSRB is now a civilian and political agency—not military.

First chairman of the board, Arthur Hill, who resigned recently, is a business executive. But he had been closely associated with Secretary of Defense Forrestal when Mr. Forrestal was Secretary of the Navy. Hence, much of the Board's thinking tended to be oriented to the military point of view.

When John Steelman, presidential advisor, was appointed acting chairman of the agency after Mr. Hill left, it indicated that the Board henceforth would be an adjunct of the White House, not the Pentagon. Mr. Wallgren's appointment confirms this.

Mr. Wallgren is no industry man. Mr. Truman felt that his experience as (1) U.S. Senator from Washington and (2) member of Mr. Truman's War Investigating Committee fitted him for the job.

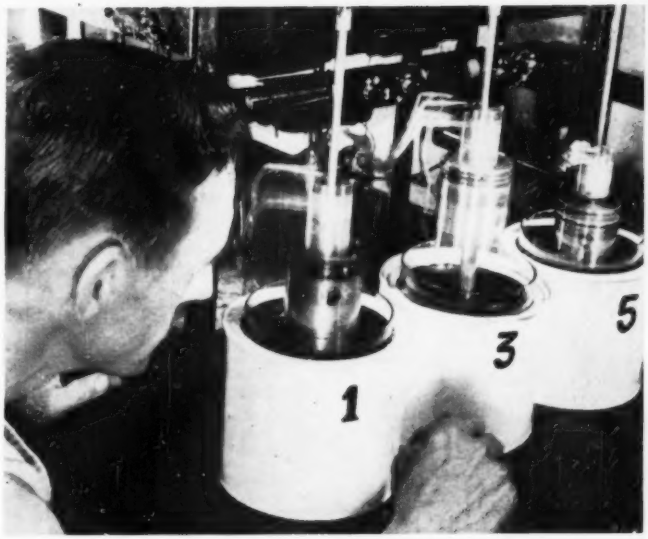
Salvage Program Pays for Its Cost

A scrap salvage and segregation program that more than paid for its initial cost—which ran into many thousands of dollars—within six months is in operation at the Norris Stamping and Manufacturing Company, Los Angeles.

The plant system was lauded recently by A. A. Throckmorton, manager of the metal procurement division of Permanente Products Co., in a plea to industry to conserve aluminum supplies in the current unprecedented shortage of the metal.

Bicycle Plant for India

MYSORE, India (McGraw-Hill World News) — Industrially advanced Mysore state, in South India, is mapping the establishment of a bicycle factory in conjunction with Dayton & Co., British firm. There are only two major bicycle plants in the country at present.



***NEW METHOD** of measuring heat within a piston moving as fast as 2000 r.p.m. within an engine, revealed by engineeers in the Beacon, New York, laboratories of The Texas Co., employs air-cushioned plungers which contact at intervals a thermocouple placed inside the piston. Heat is determined by measuring, on a meter, current induced by the thermocouple, and thorough elimination of oil films is achieved.*

New Labor Law Slated by May; Expect Closed Shop Ban Will Be Lifted

WASHINGTON—You should have a new labor law by May. It won't be the old Wagner Act, but something in between the 1935 law and Taft-Hartley. Exactly what? That remains to be decided.

This much is assured: It will have more in it than President Truman asked for in the Administration bill —S. 249 in the Senate and H. R. 2032 in the House.

The Truman bill would repeal Taft-Hartley and reenact the Wagner Act with these major amendments:

(1) Authorize the President to order a 30-day cooling-off period in a national emergency dispute while an emergency board prepares recommendations for settlement;

(2) Make jurisdictional strikes and secondary boycotts in support of them an unfair labor practice;

(3) Require 30-day notice to the Government before a labor contract may be revised or terminated, and

(4) Encourage arbitration of disputes over application of an existing contract.

Will Authorize Injunctions

The new law will have this and more. For one thing, it is likely that Congress will authorize injunctions or plant seizure to deal with national emergencies. Truman has no objection to them. This issue, of course, is of little concern to the metalworking industry. More important to this industry is what will happen on some of the lesser points in the law. Here is a quick run-down on the outlook on some of them:

Jurisdictional disputes—These and related secondary boycotts will be unfair union practices. The only question is whether to retain the injunction or provide some other restraint against them.

Foremen—They will regain bargaining rights, with the possibility that Congress may make foremen stay independent of production workers.

Free speech—Likely to be retained is the Taft-Hartley rule that permits free speech on both sides that is not coercive and does not promise benefits.

Closed shop—The ban will be lifted. In doubt: whether to give precedence to anti-closed shop laws in a dozen states.

Craft unions—They'll be given equal rights with industrial (CIO) unions. Sign them to do business with the labor board.

Aircraft Industry Shows Profit; High Speed Planes Pose Tooling Problems

The aircraft industry made a profit last year for the first time since the end of the war.

Sales topped a billion dollars setting a new peacetime record. Preliminary survey by the Aircraft Industries Association indicated total sales volume of $1,100,000,000 for 1948—a 25 per cent increase over the $848,000,000 in 1947.

Although most airframe and engine manufacturers will report some profit for 1948 there are some that are still operating in the red. Prospects for the industry look even brighter for the next two years regardless of what happens to the fiscal 1950 National defense budget.

1950 Increase Due

Military aircraft sales alone are estimated at $1.7-billion for 1949 with a slight increase in 1950. This is due largely to the $2.9 billion in new aircraft contracts authorized in last year's military airpower budget. Most manufacturers will be paid on contracts let last year as they deliver completed planes in 1949 and 1950. Airframe deliveries are expected to rise to 25 million pounds during 1949 and increase to 37 million pounds during 1950.

Industry is now in the production tooling stage on the bulk of new plane orders placed under last year's contract authorizations. Employment is still on the rise with severe shortages in tool fabrication personnel. Production problems of the high speed aircraft ordered under last year's program are posing new problems in tooling and manufacturing methods. Machines for forming new type metals, new tools and processes for machining these metals and new type production tools and jigs are required for the paper-thin wing, new fuselage shapes and complicated control systems of transonic plane types. Among new tooling developments are production tools made from laminated fiberglas, explosive rivets for fastening inside sheets on ultra-thin wings and milling machines to taper wing skin.

$10-Million of Machine Tools Held by WAA

War Assets Administration still has over $10,000,000 worth of equipment generally classed as machine tools, nearly all cats and dogs. Purchasers of WAA plants often refuse the tools, which are added to the inventory. But JANMAT is standing by to tag nearly everything worth having.

Sharp-eyed bargain hunters still find a few useful items. Imaginative tinkers devise ways of converting odd jobs to practical purposes, at a profit. But mostly the spot bid specialists have high junk prices in mind.

Over half of WAA's tool inventory is in the Bronx warehouses; $590,000 at Philadelphia; $1,835,000 at Cincinnati; over $2,000,000 at Chicago; an unstated volume at Boston. The figures are very approximate.

U.S. Machinery for Razor Blade Plant

Former world heavyweight boxing champion, Gene Tunney, has had talks in Canberra with Prime Minister Chifley on the establishment of a factory in Australia to manufacture razor blades. Capital for the enterprise was assured in Australia, and machinery would be brought from America.

***SPECIAL MACHINE** to make residential screen is most recent addition to Trentwood aluminum rolling mill of Permanente Metals Corp., near Spokane, Wash.*

Development of Steel Shell Cases Pushed by Army, Navy Ordnance

WASHINGTON—Steel shell cases are being developed further by Army and Navy Ordnance as a practical "must" in any future large-scale military operations. Reason is the wartime drain on copper for the brass used in ammunition. This was enormous, and if repeated would be alarming.

Germany tried steel cases in World War I with little success. The U. S. expanded use of steel in World War II, but with difficulties. The Air Forces rejected steel because jamming in flight is a great risk.

The Army is working on 105 mm. cases first because this size consumes vast quantities of metal, and it is the easiest problem, since breech pressures are light, and steel can be cold treated. WD-1010 steel, same as SAE, is cheap and suitable for the job. WD-1024 steel is heat-treated for the 90 mm. air and tank gun case.

All sizes, including small arms cases, will be developed in steel, by Army and Navy joint effort. The prospect for success is good. Big Navy guns and Army field guns do not use shells, bagged charges being placed in chambers behind projectiles.

Salvage of cases is important, and is practiced to the fullest extent by all services. Used brass cases must be cleaned or the residue of powder will corrode them. And they must be heat-treated soon after firing to relieve internal stresses established by firing pressures, or they will check beyond re-use.

Used steel cases also require relief of stress by heat-treatment, but the problem is much simpler. New steel cases require protection against corrosion. Phenolic lacquer does the job, but it acts as a di-electric and interferes with electric firing. When conducting materials are added, they reduce anti-corrosive characteristics. This is being worked on. Zinc coating is good, but zinc, like copper is critical. Both Army and Navy are working on re-use and re-sizing of steel shells.

Mullins Manufacturing Corp., Salem, Ohio, is doing development work on the 105 mm. steel case. Norris Stamping and Manufacturing Co., Los Angeles, has a contract on the 90 mm. size.

Ordnance officials were a little surprised at other manufacturers' lack of interest in calls for bids on steel case work. However, equipment problems are understandable. Army Ordnance expects to offer contractors some of its surplus steel case equipment.

Other possibilities for shell cases are the light metals, aluminum and magnesium, and plastics, both to relieve the drain on heavy metals and to reduce the weight of air-borne ammunition.

World Aid Plan Backed by MAPI

"Know how" and equipment instead of expendable or consumable materials—President Truman's inaugural-address program for war depleted and nonindustrialized areas of the world—is backed by the Machinery and Allied Products Institute speaking for the capital goods industries of the country.

Administration's recognition of the inadequacy of our industrial plant is encouraging, MAPI says. The Institute endorses technological advancement as the way to higher living standards, both at home and abroad.

Noting Mr. Truman's observation that material resources are limited while technological knowledge is inexhaustible, MAPI holds that such a plan of economic cooperation with other countries will be welcomed by the capital goods industries as a far-reaching program to be aggressively pursued. The amount of progress realized rests with the interest and enterprise of top business executives, especially in the manufacturing industries.

MAPI outlines three ways of providing needed technicians, administrators, supervisors and managers:

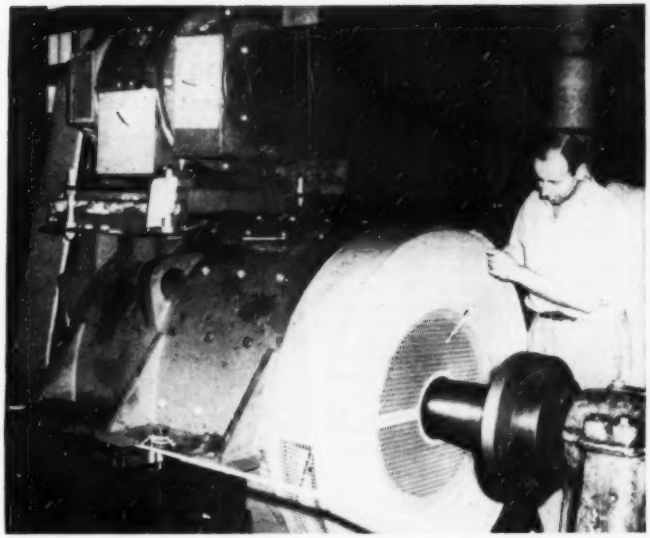
1. Internal development by trial and error without outside help—a slow and unreliable process.
2. Send-personnel from weak areas into developed areas like the U.S.
3. Import into these areas the required technical and managerial leadership, not only in the use of capital equipment but also in the training of the local personnel.

Financial problems are not as important as the problems of leadership personnel, the Institute said, believing that if foreign projects succeed financial problems will become easier. Success or failure, the Institute adds, will be determined by the leadership, technical and managerial, given to these undertakings.

Radio-Active Piston Rings Test Engine Wear

OAK RIDGE, TENN.—Experiments with piston rings made radioactive in the uranium chain-reacting pile at the Oak Ridge National Laboratory here forecast possible wide benefits in time to the American motoring public and operators of motorized equipment in general.

The California Research Corp., a subsidiary of Standard Oil Co., of Calif., and the Isotopes Division of the Atomic Energy Commission, said in a joint announcement that the corporation's research staff is successfully using radio-active piston rings to test the effect of fuels and lubricants on engine wear.



MARINE propulsion generator, 350-kw, goes on test at the Fort Wayne Works of General Electric prior to being installed aboard one of two new ferryboats for Norfolk County (Va.) Ferries.

New Military Stockpiling Requirements May Cut Into Civilian Metal Needs

WASHINGTON — Military stockpilers have changed policy which may mean a conflict with civilian supply of strategic materials.

Until last summer, the Munitions Board had operated under a policy which allowed stockpile procurement from civilian markets only where it would not conflict with civilian demand. Since July, however, the Board, through the Bureau of Federal Supply, has been buying on the open market without regard for civilian demand.

So far the change in policy has not meant much, but from now on out it might. The stockpilers have committed their $525-million appropriation for fiscal 1948, and have asked Congress for a supplemental appropriation of $310-million to fill out the fiscal year's procurement program. Of this, $40,000,000 is in cash, the rest in contract authority. Next year's stockpiling budget calls for another $600,000,000.

May Cut Into Civilian Supplies

Donald F. Carpenter, chairman of the Munitions Board, says that under the new policy it may be necessary in some cases to cut into supplies needed to fill civilian needs. "This will mean only the deferment of a few requirements now so that the country will not be dangerously short of critical materials later, should there be a National emergency," Carpenter said.

About the only tight commodities that might be squeezed by stockpile buying are aluminum, copper, lead, zinc and tin. The Munitions Board chairman pointed out that voluntary agreements with producers of copper, lead, and zinc have been made and that those producers have given assurances that they will furnish the amounts required to meet the Board's goals for the fiscal year. This can be interpreted to mean that producers will do the rationing, and can be expected to soften the blow on important users of the commodities.

In August, the Board announced its purchasing objectives for the first fiscal quarter (July-Sept.), contained in the list of commodities slated for delivery by June 3, 1949, where the following quotas were established for the entire year:

Bauxite, 503,000 long tons; castor oil, 15,000,000 pounds; chromite, 30,000 long tons; columbite, 1,100,000 pounds; diamonds, 350,000 carats; lump graphite, 1,000 tons, and flake (lubricant) graphite, 500 short tons; manganese ore, 20,000 long tons of battery grade and 350,000 long tons of metallurgical grade; mica, 1,242,000 pounds; monazite, 500 short tons; nickel, 15,000,000 pounds; block talc, 250 short tons, and tin, 4,500 long tons.

Detroit

TOOLING INDUSTRY BESET BY PROBLEM OF DIE TRYOUT... MORE COMPLICATED TOOLS PREDICTED... CONSUMER DEMAND WAVERING

One of the large problems worrying the tooling industry—aside, of course, from the current softness of order banks—is the matter of die tryout. In particular the companies supplying the automobile trade are being called on more and more to do tryout work and deliver tools ready for volume production. The automotive situation applies in lesser degree to specifications of other industries.

The automobile requirement of tryouts springs from the desire of car makers to shift from one model to another in a very minimum of time—sometimes only a few hours, and at most (in the case of some changeovers from 1948's to 1949's) a week or so. The telescoping of the former changeover of a month or two into about an equal number of days has caused the auto producers to demand that their diemakers do tryout work formerly done at manufacturer points during model change shutdowns.

Tryout Facilities Needed

Now tryout work requires a big press, more likely a bank of big presses. The small presses which are the customary maximum of equipment in most tooling shops cannot fill the bill. Some producing companies have indicated to the tool and die shops that their future orders will depend in at least a fair degree on whether the shops can provide tryout facilities.

Practically none can, at least in the full measure. And to qualify themselves for such requirements they must spend tens of thousands of dollars for equipment which would run only a few months in the year, and hence would be all but impossible to amortize. This problem of irregular use, of course, is the very reason the car makers themselves do not order tryout equipment for their own account to fit their tight changeover programs.

More Complicated Tools

Discussions between tooling companies and buyers these days do not confine themselves to the tryout question, although that issue is heard loud and lengthily whenever two such groups get together. Another issue of note is the future trend in tooling manufacture: What is developing?

The best answer seems to be that tools will become more and more complicated as the years go on. The reason is an increasing insistence in the user companies that the product be made in fewer operations.

This extra effort in die design and building reflects itself in higher costs which tooling companies have to pass on. If today's tooling requirements were simply duplications of prewar equipment, the invoices would not be increased nearly so much.

MORRIS OXFORD— *Never before sold in the United States, the 13.4 hp. Oxford is one in the new Morris line introduced to the public at the International Automobile Show in New York this month. Features: chassis integral with body, inter-axle seating, rubberized suspension to eliminate maintenance lubrication, and front brakes fitted with double-leading-edge shoes.*

Press for Lower Tool Costs

On the score of costs, tool companies are telling the car makers that the best way they can see to cut down charges is to place orders far enough ahead that the work can be done on a straight 40-hour basis per week, rather than on overtime schedules. Beyond that, some shops are putting in newer and more efficient equipment for doing their tasks. As the pressure for lower tooling costs builds up, tool shops may become increasing fertile ground for machine tool salesmen to cultivate.

Right now there would be resistance to capital expenditures in these shops. They are dragging bottom as they have not done since before the war. The only notable automotive work at hand and in prospect seems to be on the 1950 Cadillac, which appears the first—perhaps the only—segment of the G.M. line slated for marked change.

Tool and die employment, consequently, is declining. This holds true not only in the independent shops in the Detroit area, but in the captive shops as well—one report is that one of the largest captive shops in the industry has laid off back to men of 1928 seniority.

Consumer Demand Wavering

Against this backdrop of minor preparation for 1950 models, the auto industry itself is feeling its solid base of consumer demand wavering. Except for Ford, Chevrolet, and Cadillac, practically any car made today is obtainable in fairly short order. This does not mean that they are everywhere obtainable, nor that at many points the would-be buyer does not have to make a sacrifice with his trade-in. But it does mean that a man can buy a car today where he was unable to six months ago, or even three months ago.

Market May Improve

This has not notably translated itself yet into production. True, Kaiser-Frazer has cut back, and other companies are not pressing as hard as they were a few months ago for steel to enlarge their schedules. The large question of the day in Detroit is which situation will win a race—the reducing demand, or the seasonal upturn ahead. Given an early spring and the expected market improvement, auto companies will not have to cut back, though time margins in many instances will be thin. Given a late spring, cutbacks will almost certainly appear on production schedules. Meanwhile, the resumption of Chrysler divisions on their 1949 models has stiffened the industry output rate, which has stood well ahead of 100,000 units a week during February; and even if reductions do occur on individual schedules, a break under 100,000 is hardly indicated.

Names in the News

Ralph M. Johnson

John R. Bartizal

Ralph M. Johnson has been appointed vice president in charge of sales, Norton Company, Worcester, Mass. He was formerly vice president and general sales manager for the company's Abrasive Division.

James L. Myers, president of Cleveland Graphite Bronze Co., has been elected president of The Associated Industries of Cleveland. Other officers: **A. E. Gibson,** president of the Wellman Engineering Co., vice president; **Claude E. Murray,** executive vice president of the Willard Storage Battery Co., treasurer.

Edwin S. Lewis has been appointed director of purchases of Donovan Wire & Iron Co., Toledo, Ohio.

W. J. Haring has been appointed Technical Director of The Quaker Chemical Products Corp., Conshohocken, Pa.

Sam S. Mullin has been elected president of Cleveland Pneumatic Tool Co.

B. John Heiser has been elected president of Central Ohio Steel Products Co., Galion, Ohio.

Howard E. Pellett has been appointed sales engineer, covering California, Nevada and Arizona, for Riehle Testing Machines Division of American Machine and Metals, Inc., East Moline, Ill.

Alan P. Beebe has been reappointed to the board of directors and is now taking an active part in the management of Peninsular Grinding Wheel Co., as chairman of the executive committee. The committee is operating in place of the president.

John R. Bartizal has been named executive vice president of Clearing Machine Corp., Chicago.

Robert W. Moffett has resigned as general manager of fabrication, Lukens Steel Co., Coatesville, Pa. **Raymond M. Dennis** has been named manager of fabrication — By-Products, and **Frank C. Kardevan,** manager of fabrication—Lukenweld.

Lyle H. Harvey has been elected executive vice president and general manager of the Parsons Corp., following the recent merger of Parsons Industries, Inc., of Traverse City into the Parsons Co., Detroit, a new corporate name. **John T. Parsons,** former president of Parsons Industries, becomes vice president in charge of aircraft, automotive sales and product engineering. **Thorsten Benton** has been named secretary of the new corporation and manager of operations at Traverse City.

Alden K. McCollum has been named manager of the General Electric Co. laminated plastics plant at Coshockton, Ohio.

A. W. Bornhauser has been elected president of Jones-Dabney Co., Louisville, Ky., a division of Devoe & Raynolds, New York.

Norman J. Leary has been appointed manager of industrial sales and service, Circo Products Co., Cleveland.

Melville Morris has been named executive vice president and member of the board of directors of Optimus Equipment Co., Matawan, N. J.

Dr. John F. Thompson has been named president of The International Nickel Co. of Canada, Ltd. Other appointments: **Dr. Paul D. Merica,** executive vice president; **Henry S. Wingate,** vice president and secretary.

John S. Conant has been appointed director of procurement of Willys-Overland Motors, Toledo, Ohio.

J. R. Thompson has been named manager of flat belting, conveyor, elevator and transmission belting in the Industrial Products Sales department of the B. F. Goodrich Co., Akron, Ohio. **Paul W. Van Orden** has been named manager of "V" belts and packing.

Daniel Mapes, vice-president in charge of engineering and development and a director of Walter Kidde & Co., Inc., was elected a vice-president of the Compressed Gas Association.

Dr. Franz L. Alt has been appointed assistant and acting chief of the Computation Laboratory of the National Bureau of Standards, Washington.

James P. Malmstrom has joined the Standard-Thomson Corp., Dayton, Ohio, automotive and aviation parts manufacturer, and will establish an electronics and aircraft equipment division.

James R. Beers has been appointed assistant district manager of the United States Steel Supply Co.'s Pittsburgh warehouse.

Norman Bouder, Howard F. Smalley, Robert Carpender, and **Melvin J. Faby** have been added to the Research and Development Laboratories' Staff of the Pemco Corp., Baltimore.

Oliver S. Ackley

Oliver S. Ackley, for twenty-two years secretary of Niles Tool Works Co., Hamilton, Ohio, is retiring March 1, 1949.

J. H. W. Conklin

J. H. W. Conklin, sales manager of the Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich., was elected president of the Materials Handling Institute.

Carl F. Roby, former vice president of Cincinnati Milling Machine Co., has been named to the board of directors.

E. M. Slonaker, district sales manager for Willard Storage Battery Co., Chicago, has been named to direct the company's Related Products Division.

Stewart Kerr, Detroit attorney, has been named executive secretary of the National Association of Engineering Companies, with headquarters in Detroit.

T. F. Rose has been named manager of Timken Roller Bearing Service and Sales Ltd., Toronto, Ontario.

James F. Higgins and **Leo L. Goldner** have been elected vice presidents of Baron Steel Co., Toledo, Ohio.

Francis W. Vigneault, Jr., has been named district representative for tractor equipment in the northeastern territory, Hyster Co., Portland, Ore.

John G. Wood, former chief engineer, has been named executive assistant to the general manager for engineering, Chevrolet Motor Division of General Motors Corp., Detroit. **Edward H. Kelley** has succeeded Wood as chief Chevrolet engineer.

Black & Decker Manufacturing Co., Towson, Md., has announced these appointments: **James F. Moore,** sales engineer, Chicago; **W. E. Boyles,** sales engineer, Cleveland; **R. B. McClellan,** service engineer, New Orleans; **Thomas Rogers,** sales engineer, Dallas.

Malcolm D. Corner has been appointed commercial research manager for American Bridge Co., with headquarters in Pittsburgh, Pa.

BUSINESS ITEMS

Roll Forming Corp., Shelbyville, Ky., has moved plant and offices to larger and more adequate space in a new building at First St. and Goodman Ave.

Gits Brothers Mfg. Co., Chicago, manufacturer of lubricating devices and shaft seals, has opened a new Michigan branch office in Ludington where operations will be supervised for the entire State of Michigan.

Ralph W. Atkinson Co., 3711 Santa Fe Ave., Los Angeles 11, Calif., has been appointed sales representative of Production Devices Inc., Whitehall, N. Y., and will handle the sale of Airlox pneumatic vises, hydraulic vises, and power units, in California.

Chain Belt Co., Milwaukee, announces that its Los Angeles district office and warehouse has been moved to new and larger quarters at 3838 Santa Fe Ave., Los Angeles 11, Calif.

Norse Twist Drill and Machine Co., New Bedford, Mass., has opened a new branch office at 1903 South Harwood St., Dallas, Texas.

Pulmosan Safety Equipment Corp. has moved to a new address at 644 Pacific Street, Brooklyn 17, N. Y., from 176 Johnson St., Brooklyn. The new quarters will house laboratories, offices, manufacturing and warehousing facilities.

General Motors Corp.'s Electro-Motive Division has moved all switching locomotive production from the parent plant at La Grange, Ill., to the Cleveland plant, at 8500 Clinton Road.

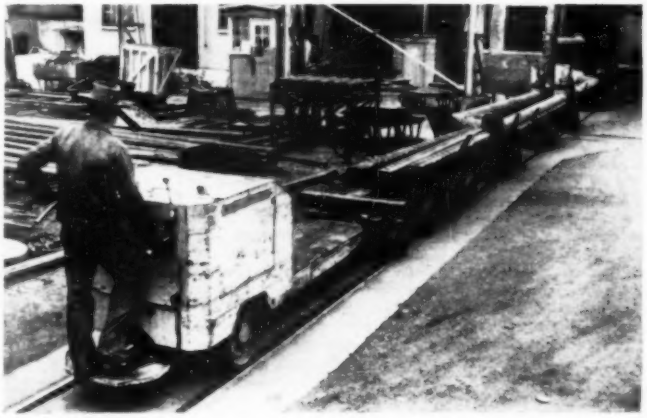
Bond Industrial Equipment Co., 51 Clarkson St., New York, has been granted distributorship for Clark Equipment Co.'s complete line of fork lift trucks and industrial towing tractors.

Standard Locknut and Lockwasher, Inc. has moved into new and larger quarters at 118 West St. Clair St., Indianapolis, Indiana. The former location was at 311 N. Capitol Ave., Indianapolis.

OBITUARIES

Hugo L. Olson, 71, president of Sundstrand Machine Tool Co., Rockford, Ill., and its subsidiary, American Broach and Machine Co., Ann Arbor, Mich., died Jan. 31, after a heart attack. He was active for many years in a score of Rockford industries and business enterprises, and was internationally known as a machine tool builder. Born in Wermland, Sweden, he came to Rockford at the age of 15. In 1910 he joined Rockford Tool Co. and Rockford Milling Machine Co. as secretary and general manager, and became one of the organizers of Sundstrand Adding Machine Co. When Rockford Milling Machine Co. and Rockford Tool Co. were incorporated in 1929 into Sundstrand Machine Tool Co., Mr. Olson became president and general manager.

Harry Woodward Beedle, former manager of Boston Branch, The Electric Storage Battery Co., died on Feb. 3. He was 69 years old, and had retired in June, 1948.



***BATTERY-POWERED** truck pushes a trainload of heavy, irregularly shaped pieces in Plant 1, Chattanooga Division, Combustion-Superheater, Inc. Trucks that carry no more than three tons can move 20,000 or more pounds by this method.*

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While this "miracle" of inspection productivity has been accomplished by Sheffield on automotive pistons, thousands of other parts can be multiple-inspected with proportionate savings and increases in productivity.

Yours can be one of the many plants to reap the benefits of multiple and automatic inspection equipment developed and built by Sheffield. If it's "inspection productivity" you want, *Chek with Sheffield*, first the pioneer and now the leader in the manufacture of multiple and automatic inspection equipment.

Wire, phone or write for a Sheffield Field Engineer to call and discuss your problem —or send prints and an outline of your requirements to Sheffield at Dayton.

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The miracle of many small parts originating from widely scattered shops converging into a perfect assembly with an accuracy in split tenths is totally dependent on precision controlled by gage blocks.

In making them there is not only the problem of accuracy as concerns one block but the job of controlling the accuracy of the entire set.

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But in routine examinations the accumulated error in 40 blocks proved to be less than 1/100,000 part of an inch.

That's the kind of precision that Webber Blocks offer to its users, an assurance that speeds production and lowers cost.

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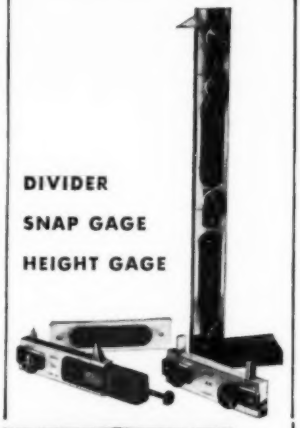

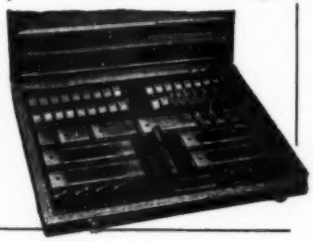

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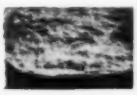
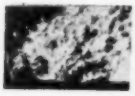
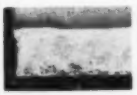
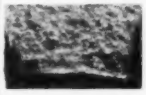
COURTESY LINDE AIR PRODUCTS COMPANY

	WHAT TO NOTICE	COPPER	BRASS AND BRONZE	ALUMINUM & ALLOYS†	MAGNESIUM	MONEL METAL
APPEARANCE	FRACTURE					
		red color	red to yellow	white	White	light gray
	UNFINISHED SURFACE	Various degrees of reddish brown to green due to oxides; smooth	Various shades of green, brown, or yellow due to oxides; smooth	Evidences of mold or rolls; very light gray	Evidences of mold or rolls; very light gray	Smooth; dark gray
	NEWLY MACHINED SURFACE	Bright copper red color dulls with time	Red through to whitish yellow; very smooth	Smooth; very white	Smooth; very white	Very smooth; light gray
CHIP TEST	APPEARANCE OF CHIP	Smooth chips; saw edges where cut	Smooth chips; saw edges where cut	Smooth chips; saw edges where cut	Rough chips; saw edges where cut	Smooth edges
	SIZE OF CHIP	Can be continuous if desired	Can be continuous if desired	Can be continuous if desired	1/16 to 1/8 in.	Can be continuous if desired
	FACILITY OF CHIPPING	Very easily cut	Easily cut; more brittle than copper	Very easily cut	Very easily cut	Chips easily
BLOWPIPE TEST	SPEED OF MELTING (From Cold State)	Slow	Moderate to fast	Faster than steel	Faster than steel	Slower than steel
	COLOR CHANGE WHILE HEATING	May turn black and then red; copper color may become more intense	Becomes noticeably red before melting	No apparent change in color	No apparent change in color	Becomes red before melting
	APPEARANCE OF SLAG	So little slag that it is hardly noticeable	Various quantities of white fumes, though bronze may not have any	Stiff black scum	Dirty gray scum	Gray scum; considerable amounts
	ACTION OF SLAG	Quiet	Appears as fumes	Quiet	Quiet	Quiet; hard to break
	APPEARANCE OF MOLTEN PUDDLE	Has mirrorlike surface directly under flame	Liquid	Same color as unheated metal; very fluid under slag	Same color as unheated metal; very fluid under slag	Fluid under slag
	ACTION OF MOLTEN PUDDLE UNDER BLOWPIPE FLAME	Tendency to bubble; puddle solidifies slowly and may sink slightly	Like drops of water; with oxidizing flame will bubble	Quiet	Quiet	Quiet

†Due to white or light color and extremely light weight aluminum is usually easily distinguishable from all other metals; aluminum alloys are usually harder and slightly darker in color than pure aluminum.

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J. H. WILLIAMS & CO., BUFFALO 7, N. Y. *Distributors Everywhere*

Rotary Files and Burs—I

SIMPLIFIED PRACTICE RECOMMENDATION R233-48

Adherence to this recommendation of the National Bureau of Standards will simplify normal stock requirements.

Definitions: Rotary file—a tool with teeth raised by hammer and chisel; rotary bur—a tool with teeth ground from hardened blank or milled from soft blank and hardened.

Material: hand cut and milled burs—high-speed steel; ground-from-solid burs—high-speed steel, carbide or cast alloys.

Shanks: High-speed tools to 1-in. head, ¼-in. shank; over 1-in. head, ⅜-in. shank. Threaded shanks—NF thread.

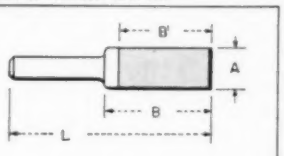
Cut: Right-hand spiral, right-hand cut.

Number of teeth: Files, counted in each row parallel to axis; burs, counted at largest tool diameter and at right angles to helix. Tolerance allowed both types, ± 15%.

Note: Where size data with illustration are labeled "H.S.S.", the designation means both rotary files and burs; where labeled "Carbide" it means carbide and cast-alloy burs.

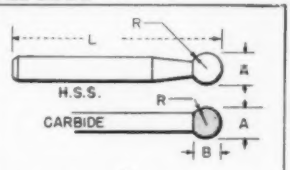
Rotary Files			DIA. OF HD. IN.	Burs		
TEETH PER INCH				TEETH PER INCH		
Rough cut	Std. cut	Fine cut		Coarse cut	Std. cut	Fine cut
14	20	30	1/8	25	32	36
14	20	30	3/16	20	25	36
14	20	30	1/4	16	25	32
12	18	27	5/16	16	20	32
12	18	27	3/8	13	20	25
12	18	27	7/16	13	20	25
12	18	27	1/2	11	16	25
12	18	27	9/16	11	16	25
12	18	27	5/8	11	16	25
12	18	27	3/4	9	13	20
12	18	27	7/8	9	13	20
10	15	24	1	8	13	20
10	15	24	1 1/8	8	11	20
10	15	24	1 1/4	8	11	20
10	15	24	1 1/2			

CYLINDRICAL SHAPE
With or without end cut



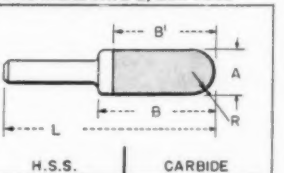
H. S. S.			CARBIDE		
A	B	L	A	B'	L
1/8	1/2	2 1/4	1/4	5/8	2 1/4
1/4	1	2 1/4	3/8	3/4	2 1/4
1/4	1 1/2	2 3/4	1/2	1	2 1/2
3/8	1	2 1/4			
3/8	1 1/2	2 3/4			
1/2	1	2 1/4			
5/8	1	*			
3/4	1/2	*			
3/4	3/4	*			
1	1	*			

BALL SHAPE



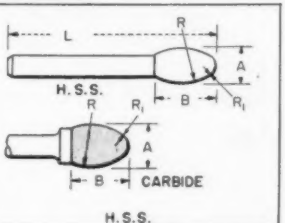
H.S.S.			CARBIDE			
A	L	R	A	B	L	R
1/8	2 1/4	1/16	1/4	7/32	2 1/4	1/8
3/16	2 1/4	3/32	3/8	5/16	2 1/4	3/16
1/4	2 1/4	1/8	1/2	7/16	2 1/4	1/4
5/16	2 1/4	5/32	5/8	9/16	2 1/4	5/16
3/8	2 1/4	3/16	3/4	11/16	2 3/16	3/8
1/2	2 1/4	1/4	1	15/16	2 7/16	1/2
5/8	*	5/16				
3/4	*	3/8				
1	*	1/2				

CYLINDRICAL SHAPE, Ball nose



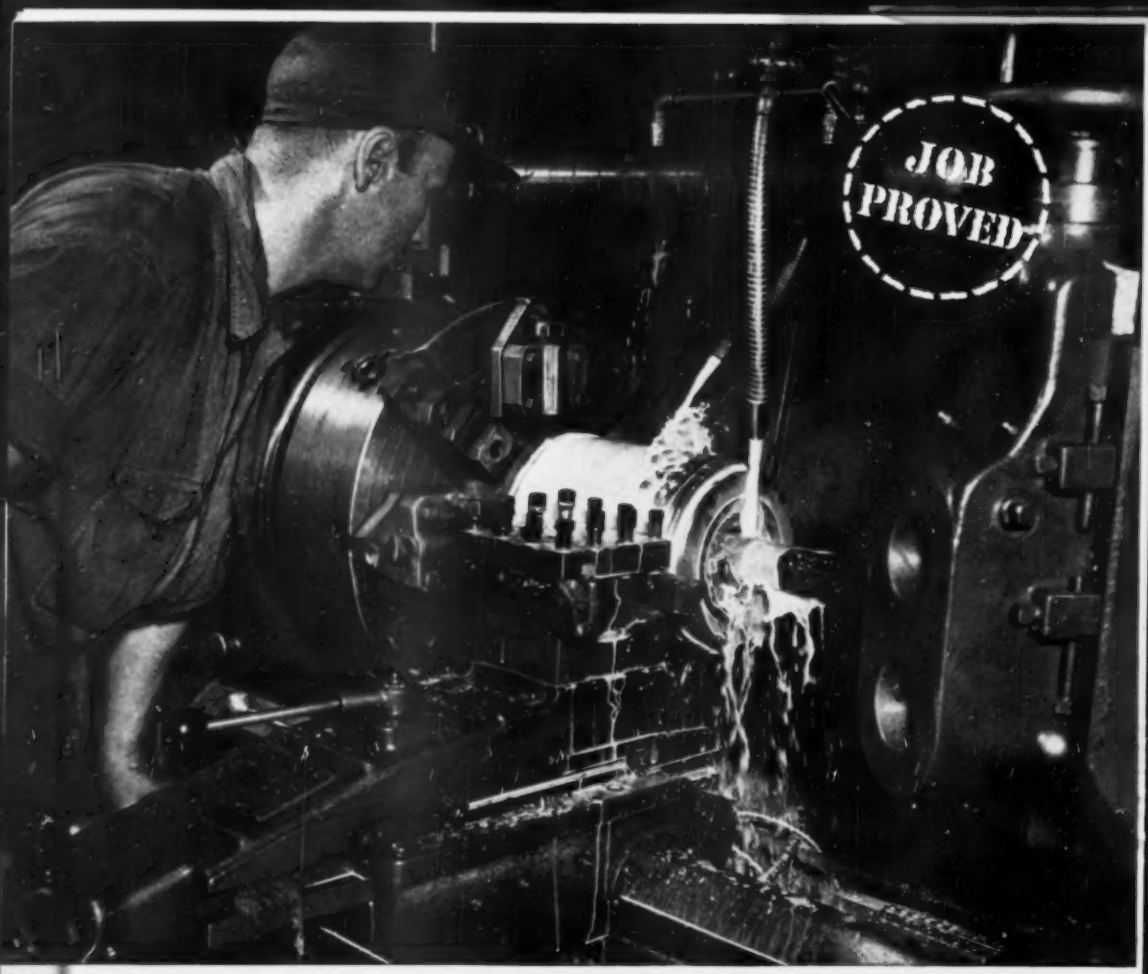
H.S.S.				CARBIDE			
A	B	L	R	A	B'	L	R
1/8	1/2	2 1/4	1/16	1/4	5/8	2 1/4	1/8
1/4	1	2 1/4	1/8	3/8	3/4	2 1/4	3/16
1/4	1 1/2	2 3/4	1/8	1/2	1	2 1/2	1/4
3/8	1	2 1/4	3/16	5/8	1	2 1/2	5/16
3/8	1 1/2	2 3/4	3/16				
1/2	1	2 1/4	1/4				
5/8	1	*	5/16				
3/4	1 1/4	*	3/8				

OVAL SHAPE



H.S.S.				
A	B	L	R	R1
1/4	1/2	2 1/4	3/4	3/32
3/8	5/8	2 1/4	7/8	5/32
1/2	7/8	2 1/4	1 1/4	13/64
5/8	1	*	1 1/4	1/4
3/4	1 1/8	*	1 5/16	5/16
1	1 3/8	*	1 1/4	13/32
CARBIDE				
1/2	7/8	2 3/8	1 1/4	13/64
5/8	1	2 1/2	1 1/4	1/4

* *Length and shank according to manufacturer's practice*



MAKING THE BIG CHIPS FLY!

Sunoco Emulsifying Cutting Oil Is Used for Rough-Finishing of Heavy SAE 3140 Forgings

The correct cutting fluid is a big factor in the continuous heavy-duty machining of tough steel forgings on the machine shown above.

Machine: Warner & Swasey 4-A Heavy-Duty Turret Lathe

Material: SAE 3140 Forging

Operation: Roughing-Out Cap for Pile-Driving Machine

Cutting Fluid: 1 part Sunoco Emulsifying Cutting Oil to 20 parts water

Sunoco Emulsifying Cutting Oil is a viscous, self-emulsifying oil that quickly and easily forms a stable emulsion with water. It contains no animal or vegetable fats, and will not turn rancid.

Sunoco Emulsifying Cutting Oil meets the demand not only of tough cutting jobs, but also of a wide range of turning, milling and grinding operations calling for close tolerances and fine finishes. It is particularly efficient where precision machining at high cutting speeds is demanded.

For full information, for samples to test on your own machines, for the services of a cutting oil specialist, call your nearest Sun office. Or write Department AM-2.

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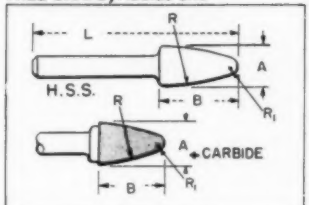
SUNOCO

Rotary Files and Burs—II

TREE SHAPE, Radius end



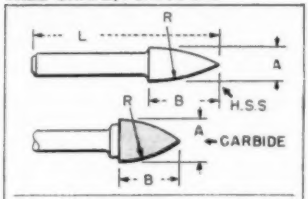
H. S. S.

A	B	L	R	R_1
1/4	3/4	2 1/4	2	1/16
3/8	3/4	2 1/4	2 1/2	3/32
1/2	1 1/8	2 3/8	4	1/8
3/4	1 1/4	*	4 1/2	1/8
1 1/8	2	*	8	3/8

CARBIDE

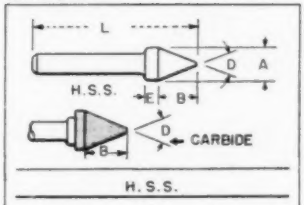
1/4	5/8	2 1/4	2	1/16
1/2	1	2 1/2	4	1/8

TREE SHAPE, Pointed end



H. S. S.				CARBIDE			
A	B	L	R	A	B	L	R
1/4	3/4	2 1/4	1/16	1/4	5/8	2 1/4	1 1/16
3/8	3/4	2 1/4	1 1/2	1/2	3/4	2 1/4	1 5/16
1/2	3/4	2 1/4	1 5/16				
1/2	1 1/8	2 3/8	2 3/4				
5/8	1	*	1 3/4				

CONE SHAPE



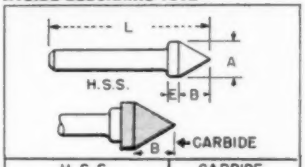
H. S. S.

A	B	D	E	L
1/4	1/2	20°	--	2 1/4
1/4	3/4	16°	--	2 1/4
1/4	1 1/4	10°	--	2 3/8
5/16	1	16°	3/16	2 1/2
3/8	5/8	28°	3/16	2 1/4
1/2	7/8	30°	3/16	2 1/4
5/8	1	32°	3/16	

CARBIDE

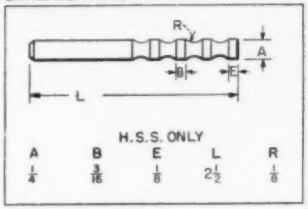
5/8	7/8	36°	--	2 1/2

INSIDE DEBURRING TOOL



H. S. S.				CARBIDE		
A	B	E	L	A	B	L
60° INCLUDED ANGLE						
3/8	11/32	3/16	1 3/4	1/2	7/16	2 1/8
1/2	7/16	3/16	1 3/4	7/8	3/4	2 7/16
5/8	7/16	1/2	*			
3/4	7/16	3/8	*			
1	17/32	3/8	*			
90° INCLUDED ANGLE						
3/8	3/8	3/16	1 3/4	1/2	1/4	2
1/2	7/32	3/16	1 3/4	7/8	7/16	2 1/8
5/8	9/32	1/2	*			
3/4	5/16	3/8	*			
1	7/16	3/8	*			
1 1/4	7/16	3/8	*			
1/2	1/2	3/8	*			

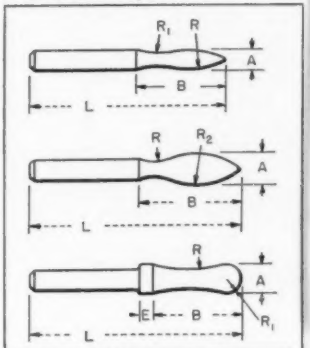
CONCAVE TOOL, 4 Grooves



H.S.S. ONLY

A	B	E	L	R
1/4	3/16	1/8	2 1/2	1/8

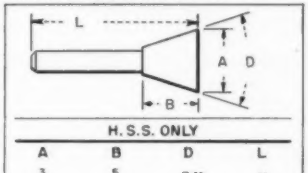
Bi-SHAPE TOOLS, 3 Sizes



H. S. S. ONLY

A	B	E	L	R	R_1	R_2
1/4	1	----	2 1/4	7/8	7/8	----
5/16	1 1/8	----	2 3/8	9/16	3/4	1/8
3/8	1 1/8	3/16	2 1/2	2	3/16	----

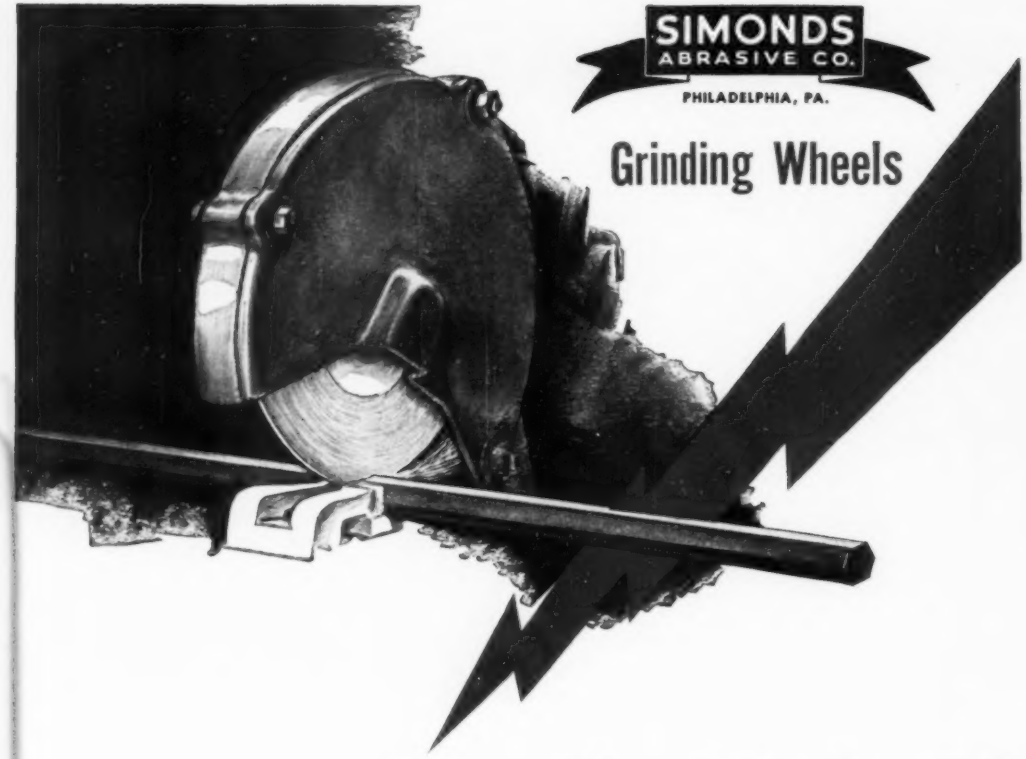
INVERTED CONE
With or without end cut



H.S.S. ONLY

A	B	D	L
3/4	5/8	34°	*

* *Length and shank according to manufacturer's practice*



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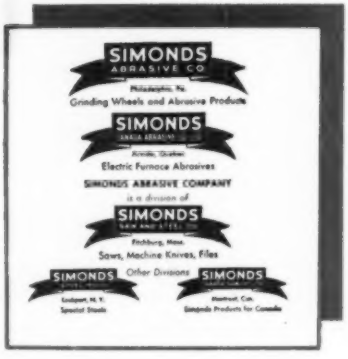
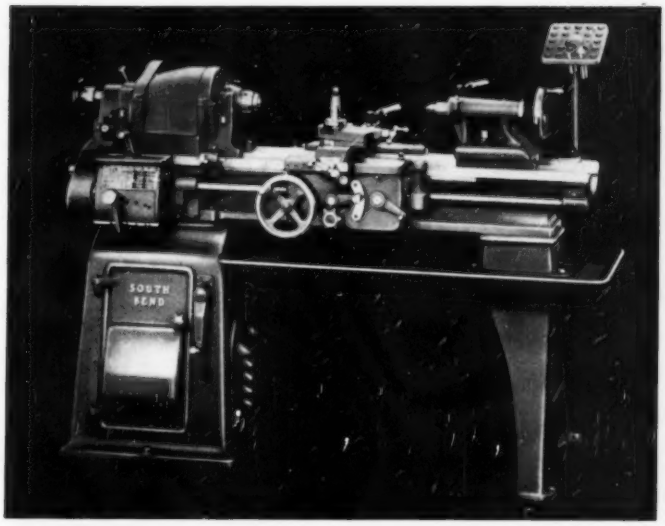


SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

Shop Equipment News



South Bend 13-in.-swing Lathe Features 1-in. Collet Capacity

A series of 13-in.-swing toolroom and quick-change gear lathes with a 1-in. collet capacity is now being offered by the South Bend Lathe Works, South Bend 22, Ind. An improved headstock spindle offers increased bore and collet capacity. Also offered is a new tailstock base with improved bed-way wiper system, and a one-point oiling system for reverse lever bracket and twin-gear bearings.

The headstock spindle has a 1⅜-in. bore and will take No. 5 South Bend Collets which have a maximum capacity of 1 in. The increased spindle capacity permits machining 1⅜-in. bar stock fed through the spindle and a suitable chuck. Bar stock to 1 in. can be fed through the spindle and No. 5 South Bend draw-in collet assembly. The bearing surfaces on the spindle are finished to a smoothness of 5 microinches and have a hardness of 56 to 61 Rockwell C.

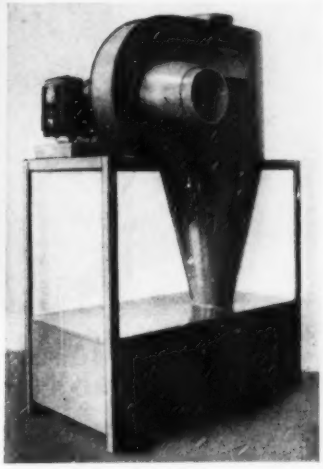
The new tailstock wiper system to keep bed ways free of chips and grit reduces wear on the ways and retains tailstock in accurate alignment.

General specifications include a 13⅛-in. swing over bed; 7¾-in. swing over saddle cross slide; 48 pitches of screw threads, 4 to 224 per in. R.H. or L.H.; 48 longitudinal power feeds—0.0015 in. to 0.0841 in. R.H. or L.H.; 48 power cross-feeds—0.0006 in. to 0.0312 in.; 8 spindle speeds—34 to 875 rpm.; and 4-, 5-, 6- or 7-ft. bed lengths.

The No. 5 South Bend Collets used are available in 61 fractional capacities down to 1/16 in. for round stock. Decimal sizes, metric sizes, and square or hexagon No. 5 collets can be supplied on special order.

Arcos Internally Fluxed Rod For Welding Deoxidized Copper

An internally fluxed copper gas-welding rod is offered by the Arcos Corp., 1500 S. 50th St., Philadelphia 43, Pa. The rod is offered for welding deoxidized copper. The self-fluxing property of Silbrax prevents repeated rod oxidation and hence faulty weld metal. Because Silbrax is fluxed internally, the heat is applied first to the metal and then transmitted to the flux. Silbrax is also used as a filler rod for carbon and inert arc welding.

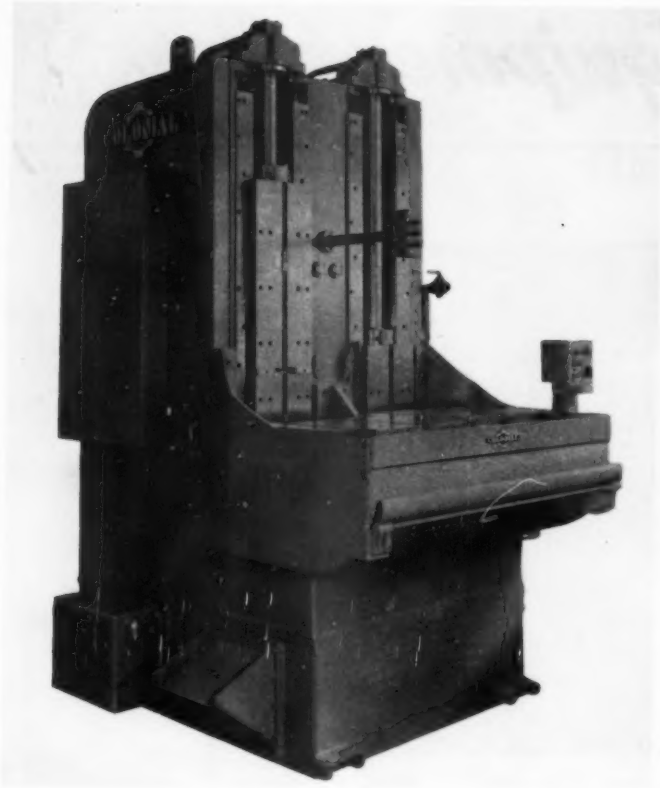


Filterless Dust Collector For Toxic, Dust-Laden Air

The Model 20N30 Dustkop self-contained portable 2300-cfm. dust collector is offered by Aget-Detroit Co., 306 Main St., Ann Arbor, Mich. The dust collector is designed for handling dust and dirt, or toxic fumes separately or in combination from various types of cutting, grinding and other machining.

The Model 20N30 employs a direct connection from the outlet of the cyclone separator to out-of-doors. Units are available with a variety of standard size inlets. Optional sizes include single 7 in., single 6 in., double 5 in., or triple 4 in.

Ratings are based on instruments tests rather than on fan tables and are: volume, 2300 cfm. with 8600-fpm. velocity, and 4.5 in. static suction, all on a 7-in. pipe. Size of the unit is 22x40x56 in.

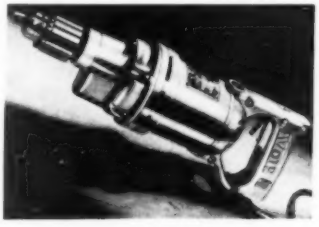


Colonial Dual-Ram Broach Machines Are Introduced in Nine Basic Sizes

A line of Dual-Ram broaching machines comprising nine basic sizes is offered by Colonial Broach Company, Box 37, Harper Station, Detroit 13, Mich. The line is designed for surface broaching, and features hydraulic and all-electric control systems, a cycle control system, a forward and reverse jog cycle to simplify setting up, and other features.

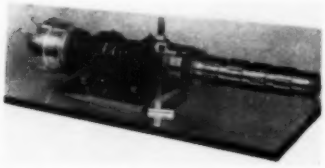
The line of machines includes the following sizes: 6-ton, 42- or 54-in. stroke; 10-ton, 42-, 54- or 66-in. stroke; 15-ton, 48- or 66-in. stroke; and 25-ton, 48- or 66-in. stroke.

With the all-electric cycling control, the machine can be set by means of the standard controls to operate on an automatic continuous cycle, single cycle or semi-automatic cycle with preset control, and forward or reverse jog cycle with ram and platen movements interlocked to prevent accidental damage to broach or part. Output efficiency is said to be increased by having the machine continue through its next cycle if the operator has finished loading before first cycle is completed.

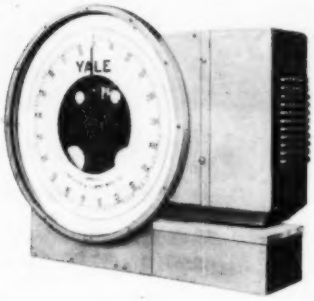


Portable Electric Drill by Wolf Built for Heavy Production Work

A heavy-duty portable electric drill is offered by S. Wolf & Co. Ltd., London, England, and distributed by Fred L. Stuart, Room 1111, 33 West 42nd St., New York 18, N. Y. With its accessories which include a bench drill stand and a bench clamp stand, it serves as a drillpress and as a bench grinder. Steel drilling capacity is $\frac{3}{8}$ in. Spindle speed running light is 750 rpm., on full load 450 rpm. The rugged English drill, NW3C, is built to stand up under continuous operation.



FIXTURE for holding tubing while the wall thickness is being checked, is offered by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio. The rotating checking fixture was designed to maintain the same high degree of concentricity in inspection as obtained in the machining of the part. The Erickson fixture includes a precision multiple-sleeve mandrel operated by an air cylinder



Yale Scale Weight Printer Prints Weights in Numerals

A scale weight printer which prints actual scale weights and identification numerals, is offered by Yale and Towne Mfg. Co., Philadelphia, Pa. It prints the actual weights in numerals 9/32 in. high without additional printing or mental calculation. The various weights in a series can be identified by printing opposite the recorded weight from one to eight symbols, numerals or letters.

The Yale weight printer can be adjusted to take tickets from 3x5 in. up to 8½x11 with one to four copies. Other features include elimination of a slow dragging or floating pointer action, and hinged selector fingers which prevent damage should the printer be operated while a load is being moved on the scale.

OUTDOOR FURNITURE MAKERS
Can Relax and Rest Easy

...when their costs are fastened down ... and sales speeded up ... by AMERICAN PHILLIPS SCREWS

VACATION FROM COST-WORRY: Assembly costs are controlled ... *fixed and held as much as 50% lower than you ever saw them before* ... when old-fashioned slotted screws are replaced by modern, power-driven American Phillips Screws, the *only* screws with the crossed, *cornerless* recess. Production and product-quality go up as worker-fatigue goes down. And profits flourish as rejects and spoilage all but vanish.

VACATION FROM SALES-WORRY: Customers *don't* like bungled fastenings with ugly, marred surfaces and broken screw-heads that snag clothes. And that's exactly why they *do* like American Phillips-fastened products ... because every fastening is cleanly made and attractive to look at, with never a burred head to spoil sales-appeal. So fasten *your* product with American Phillips Screws... *and help yourself to double profits.*

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Special Machine Made by Cincinnati Combines Milling, Broaching Work

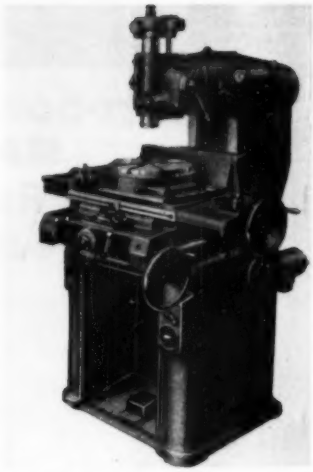
Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, offers the mill-broach machine which combines both methods for milling or broaching automotive cylinder blocks and heads. During the roughing operation, advantage is taken of the ability of milling cutters to get under the scale without excessive tooth wear. For the finishing cut, approximately 0.020 in. is removed by broaching which provides the dimensional accuracy and quality of the surface finish required.

The top, side, parting, and manifold surfaces of a V-8 cylinder head can be roughed out by milling and finished by broaching in one continuous cycle. The cycle is automatic, and production averages about 40 completed cylinder heads per hr. Actually 160 surfaces are milled and broached in obtaining the above production figure.

Two milling cutters at the first station rough the top and side surface of one casting; simultaneously, two milling cutters at the second station rough the manifold and parting surfaces on a casting transferred from station No. 1.

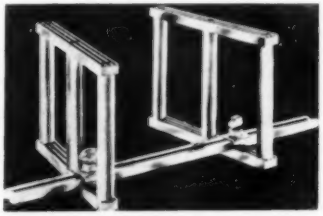
After completion of this half of the cycle the ram speed changes from a milling feed of 40 ipm., to a cutting speed of 40 fpm. to finish the job by broaching. When setting up the machine each unit may be individually operated. A roll-over fixture turns castings 180° between first and second operations.

CRANE is offered by Wayne Crane Div., American Steel Dredge Co. Inc., Fort Wayne, Ind. The crane travels on rubber tires at speeds up to 10 mph. and can turn completely around in a 22-ft. radius. Convertibility provides a ½-yard clamshell, a 5-ton utility crane or a magnet crane, using the same 30-ft. boom. The crane swings loads over 360° at 5½ rpm.



Hauser Precision Jig Borer Features Centralized Control

Hauser Machine Tool Corp., Manhasset, N. Y., factory representative of Henri Hauser, Ltd., of Bienne, Switzerland, offers a Swiss precision jig boring machine. The Hauser Model 2BA offers centralized control. All controls are within reach from the operating position in front of the machine. Micrometer screws are made of special steel, are hardened and are precision ground. Capacity is 14x8 in. Readings are in 0.0001 in. and accuracy of slide locations is 0.00015 in. All operations such as centering, marking out and checking can be carried out with accuracy.



Acro Safety Parallel Units Incorporate a 20-in. Spread

A safety parallel unit is offered by Acro Die & Stamping Co., 5328 N. Kedzie Ave., Chicago 25, Ill. It is said to eliminate make-shift methods of supporting tools, dies, jigs and similar work. It consists of two parallel units joined together on an adjusting rail with only two thumb screws to manipulate for quick adjustment to any desired spread. It is available in 3-, 5- and 7-in. heights, with a 20-in. spread in standard and heavy-duty types.

ARC WELDING CUTS COST 43%
...builds a stronger product

By A. D. NEAL,
Works Manager
B. F. Avery & Co.
Louisville, Kentucky

To avoid structural failures caused by striking hidden stumps or stones has been a major problem in the development of farm tractors and implements. By converting to welded design on key parts like axles and wheels, manufacturing has been simplified and field breakdowns virtually eliminated.

Fig. 1. *Weight reduced 30% . . . cost cut 43%.* Present design, all welded steel front axle. Has pressed steel channel frame and steel spindle housings. Inset shows former construction of cast steel.

IMPROVES DURABILITY

Experience shows that the welded designs have greater strength as well as exceptional resilience to severe mechanical shocks. Building the component parts from fabricated steel also eliminates the chance for any difficulties through inconsistencies in cast metals. Thus, with welded design, greater product dependability is achieved to meet unknown and abnormal operational needs.

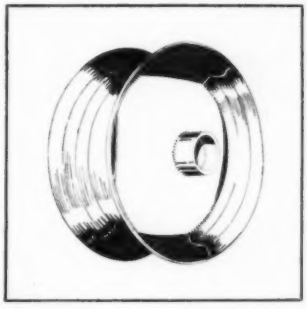


Fig. 2. *Stronger and more durable* all welded steel front wheel for farm tractor now used.

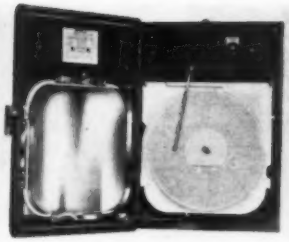
Fig. 3. *Former construction* had cast steel hub welded to rolled steel rim.

SIMPLIFIES MANUFACTURE

Substantial savings in manufacturing costs result in fabricating our tractor and implement parts with arc welding. Less material is required since components are stamped from steel plate or machined from bar stock with high speed equipment. Arc welding is done on simple, quick operating swing-type fixtures permitting fast downhand welding. On most jobs, no further machining is required after welding.

Fig. 4. *Cost cut 62% . . . weight down 69%.* Weld-fabricating a front tractor wheel. Component parts shown on table are located in simple fixture for welding.

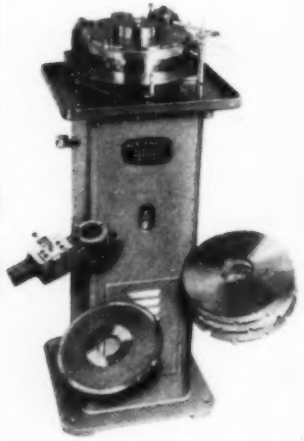
The above is published by **THE LINCOLN ELECTRIC COMPANY** *in the interests of progress.*
Machine Design Studies available to engineers and designers. Write The Lincoln Electric Company, Dept. 102, Cleveland 1, Ohio.



Bristol Running Count Recorder Plots Operations Against Time

The Bristol Co., Waterbury 91, Conn., offers a running-count recording instrument for plotting on a circular chart, a curve of number of operations against time. It records the total count of intermittent operations and the time at which each one occurs, and is used on production machinery to record work-producing operations or number of pieces produced.

The hourly rate of production can also be read from the chart. This gives information regarding effect of fatigue on operators, variation and productibility between operators, and other variations in working conditions.



Roll-O-Matic Marking Machine Produces to 4000 Pieces Per Hr.

The No. 292 Roll-O-Matic marking machine is offered by the Noble & Westbrook Mfg. Co., East Hartford, Conn. A new model dial-feed production marking machine, the Roll-O-Matic combines in one machine some of the characteristics of a general-purpose machine as it will mark inscriptions permanently into both flat and round pieces at the high-production speed of approximately 3000 to 4000 pieces per hr, depending upon the size and style of the work to be marked.

Through the use of interchangeable marking heads and work-carrier dials the machine can be set up for marking parts in a variety of shapes and sizes. The machine with tooling as illustrated has a capacity for parts from $\frac{1}{4}$-in. dia. to $\frac{5}{8}$-in. dia. and is equipped for marking five different sizes of parts on a flat surface and two different sizes of parts on a round surface.

The depth of marked inscription is controlled by initial adjustment of the die head and then by variance of spring tension or air pressure. The machine is powered by 1/3-hp. motor and occupies a floor space of 21x26-in. It is 40-in high.

Flame-Failure Safeguard Offered For Automatic-Type Oil Burners

Combustion Control Corp., 77 Broadway, Cambridge 42, Mass., offers a photoelectric flame-failure safeguard for oil flames. The system supervises both pilot gas flames and the main oil flame of automatic oil burners. The equipment consists of electronic flame-rod, Type 45JPI, photoelectric scanner, Type 45PH5, and programming control, Type 24PJ8.

If the power flame has not come on or is unsuitable for proper ignition, the flame rod signals this condition to the programming control and the burner shuts down before the main oil valve has been opened. With proper ignition the main oil valve opens and the oil flame is then monitored by the Scanner.

Air-Gage Tracer-Packaged Unit Gives Automatic-Cycle Operation

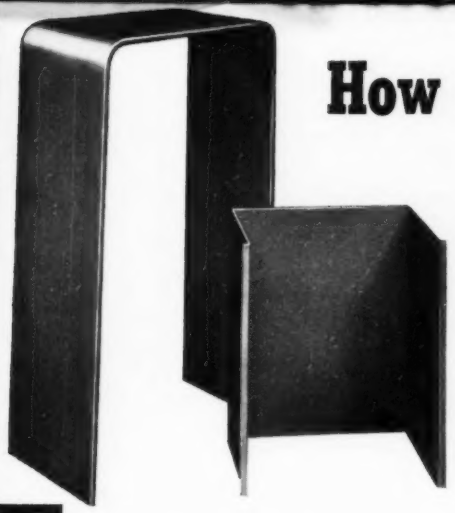
A turning - machine attachment known as the Air-Gage Tracer Packaged Unit is announced by The Monarch Machine Tool Company, Sidney, Ohio. The attachment represents a refinement of the Air-Gage Tracer. It is designed for application to Monarch 16- and 20-in. series 60 engine lathes, 20-in. Model M, 25-in. Model N, and 32-in. Model NN engine lathes.

The development provides an individual motor drive for the lathe carriage feed. Selection of the exact feed best suited to any job and automatic cycle operation are obtained. The Packaged Unit includes an electronically controlled motor drive coupled to the right end of the leadscrew.

The control system provides stepless variation of the carriage feed rate in a range of $\frac{1}{2}$ to 20 ipm. Rapid traverse return of the carriage is fixed at 100 ipm. A large indicator calibrated in ipm. is mounted on the panel and makes it easy to select the exact feed desired.

The Tracer Packaged Unit combination is said to be suited to multiple-diameter and contour turning. In providing templet control of size and shape, the Air-Gage Tracer eliminates repetitive measurements.

How to *Form* metal cabinets on a PRESS BRAKE!



By extending bed and ram beyond the ends of the press and installing tangent bending mechanisms, BATH has added cabinet forming to the already wide range of functions of its STURDYBENDER Press Brake.

Now it is possible to do a complete job on one machine—blanking, perforating, notching, bending of flanges *and forming*. Obviously, this method provides a tremendous savings in the handling of materials, and eliminates the need for special forming equipment. The tangent bending mechanism is adjustable, to permit forming a wide variety of shapes. Cabinets for refrigerators, washing machines, deep freeze units, vending machines and other similar products are already being formed by this means.

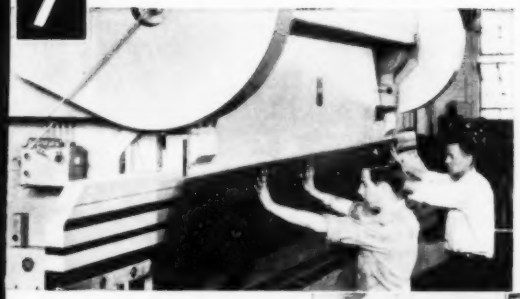
Since more and more manufacturers are finding the STURDYBENDER tangent bending device an economical answer to their cabinet forming problems, you, too, may be interested in the details. A letter will bring full information.

The CYRIL BATH COMPANY

6910 MACHINERY AVENUE

CLEVELAND 3, OHIO

1



2

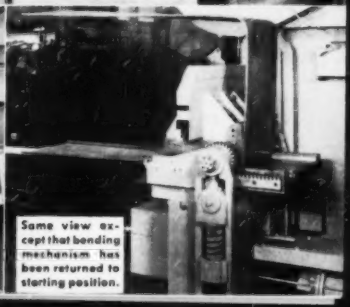
First step in production of refrigerator shell is forming 90° flange and lock flange on sides of flat sheet, conventional press brake operations.

Sheet is then inserted in tangent bending device and the first top corner bend is made. Buckling or wrinkling of flanges at the corner radius is avoided.

Sheet is moved further into the machine and second corner is formed. Once machine is set up, duplication of parts is automatic and very accurate.

3

Rear view of Step 3, showing bending mechanism at completion of bend.



Same view except that bending mechanism has been returned to starting position.

Punch Press Automatic Dial-Index Feed Offers a 12-in. Dia. Table

An automatic dial-index feed for punch presses is offered by De Castro & Associates, 2477 Randolph St., Huntington Park, Calif. The standard table of the Speedex dial-index feed is 12 in. in diameter. The die space located on the rear of the table is $3\frac{1}{2}$x$3\frac{3}{4}$ in. Over-all height is $3\frac{1}{2}$ in.

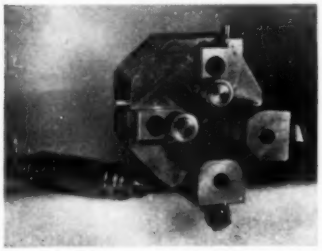
The table can be adapted to any ordinary punch press large or small without altering the press. The Speedex is said to increase production 3 to 6 times on second operation work such as assemblies, broaching and the like, by permitting the press to operate continuously either hand fed or by means of a magazine or hopper.

Morton Flash-Trimming Machines Offer Automatic Operating Cycles

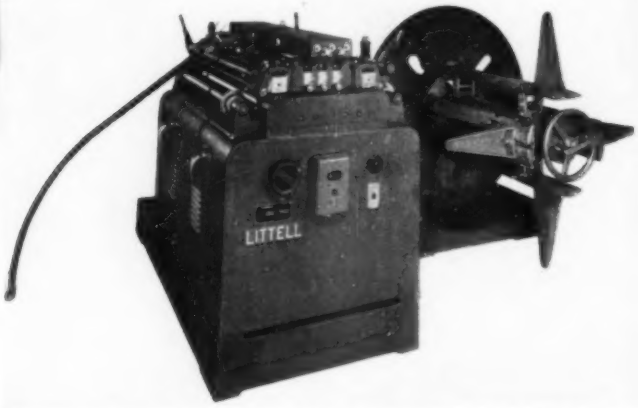
A high-production flash-trimming machine especially arranged for removing the flash or upset from strip stock or cylinders such as barrel bands or bicycle rims up to 4-in. maximum width and 3/32-in. maximum thickness, is offered by Morton Mfg. Co., Muskegon Heights, Mich.

This machine has a base which acts as a receptacle for the hydraulic fluid and operating valves. The rams are made of steel forging and machined T-shaped. Constant cut and return stroke is provided. Vertical movement of $1\frac{1}{2}$-in. between the dies is provided for entering and removing the work.

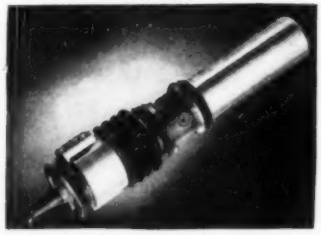
Another model offered is the vertical flash trimmer used for removing the flash or upset from butt-welded small motor frames and other cylindrical parts. It has capacity of $4\frac{1}{2}$-in. minimum to 9-in. maximum diameter, 8-in. length of stroke, and stock thickness up to $\frac{1}{4}$-in. maximum. It is hydraulically operated. A cutting speed of 50 fpm. and return speed of 100 fpm. is provided. Automatic operation of clamp, cut, return and unclamp is provided with foot pedal control.



BOX TOOL, the Multi-Micro Cut Box Tool, is offered by the Multi Micro Cut Tool Co., 3106 — 47th Ave., So., Minneapolis, Minn. The short cut box tool is designed for setup versatility to cut up to six different shoulder cuts and very short lengths. It is said to eliminate the need for cross-slide form-tool setup for ordinary straight turning. The tool has adjustable range of 1/4 to 1 1/16 in. It can take different sized shanks



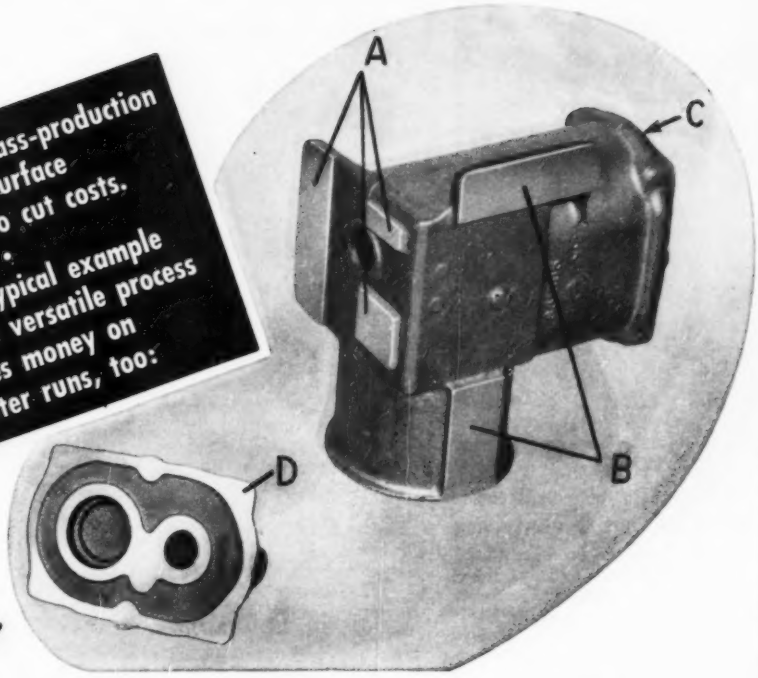
STRAIGHTENER AND REEL are offered by the F. J. Littell Machine Co., 4169 Ravenswood Ave., Chicago 13, Ill. The straightener and reel are mounted on a common base. Pinch rolls are 4 1/4 in. in diameter and 38 in. long, one set at each end. Unit is complete with a 7-roll straightener. Reel is the automatic-centering spindle type and is equipped with an electric brake to apply when power is off on the straightening machine. Coil capacity is 6000 lb. up to 36 in. wide with an inside diameter of 16 to 20½ in.



TWO SMALL SIZED RECESSING TOOLS, Series "R", are offered by the Maxwell Co., 386 Broadway, Bedford, Ohio. They have a micrometer adjusting collar which facilitates recess diameter control to within 0.001-in. or 0.050-in. per tool revolution. Models Nos. 1 and 2 tools have over-all length of 2 13/16 in. and 4 in. as compared to standard tool sizes which are 4 9/16 and 4⅛ in. respectively. These tools are available for cutting recesses ⅜ to 1 in. and from 1 to 2 in. They have a cutter ratio of either 1 to 3 or 1 to 1

You don't need mass-production to use surface broaching to cut costs.

Here's a typical example of how this versatile process saves money on shorter runs, too:



How to cut Machining costs on castings

Shown here are two of **three different castings** requiring the machining of **14 surfaces.** The 3rd casting is similar to the larger one.

All surfaces on all three castings are broached on just **one machine**—a Colonial Dual Ram—with a total of **only two broaches,** one for each ram.

Sure a setup like that cuts costs:

Machining time per face is measured in seconds instead of minutes;

One ram returns and is being loaded while the other is cutting;

Tools have to be removed only rarely for sharpening;

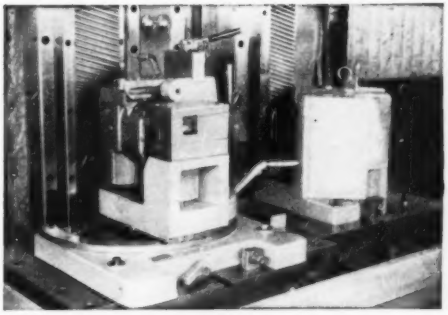
A simple fixture index eliminates extra set-ups;

Tolerances are accurately and automatically held;

In-and-out shuttling of the fixtures is automatic;

Adjusting screws on fixtures allow for unusual stock variations.

Of course your jobs may require a different type of surface broaching set-up—say on a Single Ram machine (with one broach); or on a Universal Horizontal. Regardless of the best machine type, the odds are Colonial can show you some real savings on machining of castings. We will welcome the opportunity.



What would you like to know about broaching? Drop us a line. We'll be glad to help . . .

PIONEERS OF H.S.S. BROACHING

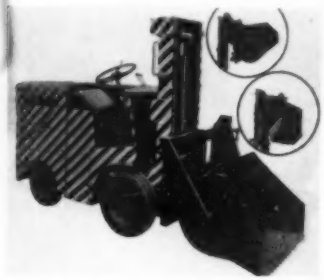
COLONIAL

BROACH CO. DETROIT 13

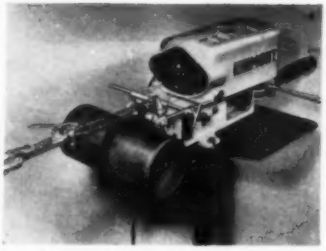
Joint-Type Adjustable Drillhead Offered for Close Center Drilling

The Thriftmaster Products Corp., Lancaster, Pa., offer a universal joint-type adjustable drillhead. The Model U620B designed for close center drilling is adjustable to 11/16-in. minimum center distance on any pattern within a 6⅝-in. diameter circle.

Spindles are regularly furnished with collet chucks, and collets can be furnished for drills between 1/32 and ¼-in. Spindles are also available with No. 1 Morse taper sockets. Model is available in two to six spindles. It operates on a 1:1 ratio and is designed for right-hand rotation of the drillpress.



INDUSTRIAL FORK TRUCKS are equipped with pneumatic tires and an automatic self-loading scoop in capacities to 15 cu. ft. The 3000- and 4000-lb. electric industrial fork trucks are offered by the Crescent Truck Co., Lebanon, Pa. The automatic scoop loads itself when driven into a pile of loose material without the use of hydraulic cylinders or other auxiliary power. A hydraulic self-actuating cylinder and metering valve assure dumping at desired speeds



Kinmont Cutting-Torch Attachment For Pipes with 3- to 36-in. Dia.

The Kinmont universal power unit is offered by the Kinmont Mfg. Co., Inc., 716-718 West Wilson Ave., Glendale 3, Calif. The cutting-torch attachment features fast adjustment of the cutting torch in handling a wide range of pipe sizes. It maintains a smooth bevel and a square cutoff across the end of the pipe. The wide adjustment range of the cutting-torch attachment permits its use on any pipe size from 3-in. up to 36-in. in diameter and on tanks up to 10-ft. in diameter when turned on a roller rack.

Vertical-Type Plate-Bending Rolls Handle Large-Diameter Cylinders

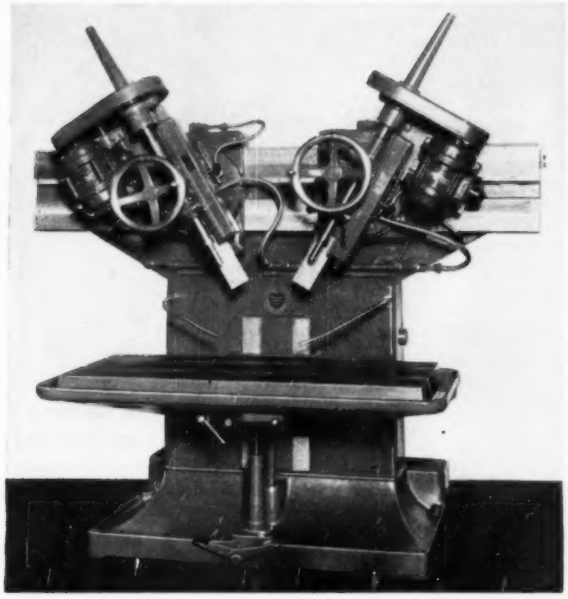
A line of vertical plate-bending rolls is introduced by the Webb Corp., Webb City, Mo. The rolls are designed for use in rolling large-diameter cylinders of light plate where true diameters must be held during the bending process. The sheet, handled with a jib crane, is inserted on edge into the machine. As it is ejected from the rollers it holds a true diameter as horizontal stress on the rolled plate is greatly reduced.

Clausing 12-in. Lathe Series 200 Has Tapered-Nose Key-Drive Spindle

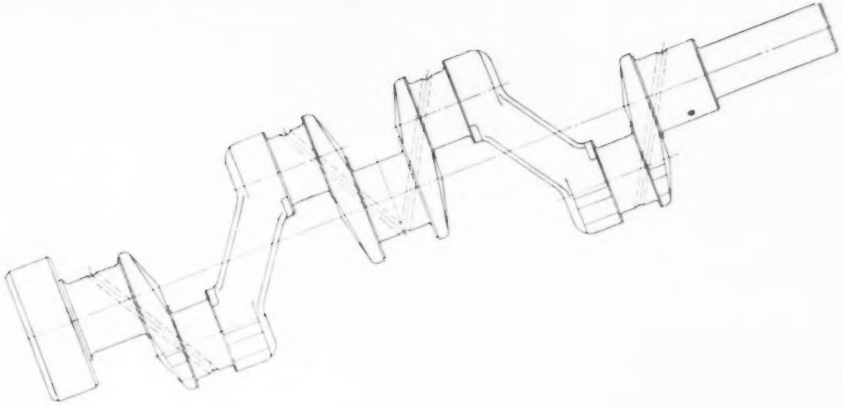
A 12-in. Clausing lathe offers a tapered-nose key-drive spindle. The new Series 200 is offered by the Clausing Mfg. Co., Ottumwa, Iowa. Both headstock and gear box are inclosed and run in oil. The inclosed motor drive offers infinite spindle speed. The ASA-L-00 size spindle is forged, hardened and ground, and rotates on its own Timken tapered roller bearing. Flat and V-ways are ground parallel within 0.001 in.

Quick-change inclosed-type gear box controls and simplified single-lever apron longitudinal- and cross-feed control are featured. The Series 200 has a 1-in. collet capacity, 1⅜-in. bore through spindle, 12¾-in. swing over the bed, and 7⅝-in. swing over carriage.

LELAND-GIFFORD



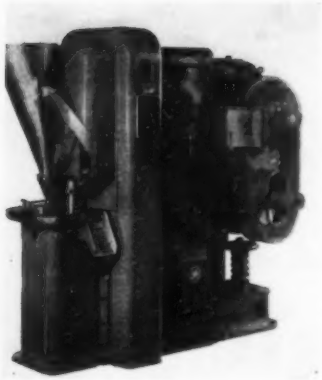
UNIVERSAL RAIL TYPE DRILLING MACHINE



- A handy machine for drilling angular oil holes in crankshafts.
- Exceptionally efficient for small lot production or for special designs and experimental parts.

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

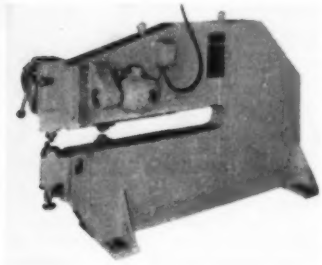


Arthur Colton Preforming Press Produces to 50 Preforms Per Min.

A 55-ton preforming press for preforming and molding plastics, powdered metals, generator brushes made from carbon and copper mixtures, and ceramic products, is announced by the Arthur Colton Co., 2600 East Jefferson Ave., Detroit 7, Mich.

The press listed as Series 55 is capable of producing as many as 50 preforms a minute and is designed for making round and odd shapes, plain or with cored holes, having up to 3-in. cell depth and 3½-in. diameter. It provides for dies up to 6-in. dia. and 3¼-in. thickness.

The press is powered by a 7½-hp. motor through a variable-speed drive so that speeds can be high for small work or slow for work requiring greater die fill time. A lever located near the worktable operates a multiple-disk clutch and also a brake which can instantly stop the press at any part of the stroke.



Sheet, Plate Cutting Machine Does Beading, Folding Cutting

A sheet and plate cutting machine called the Pullmax Sheet and Plate Working Machine does beading, folding and straight, circular or design cutting of metal to ⅜-in. thickness. Made by The Haldex Co. of Halmstad, Sweden and distributed by the Pullmax Co., 5222 North Spaulding Ave., Chicago 25, Ill., the machine is available in several sizes for working various gages of metal.

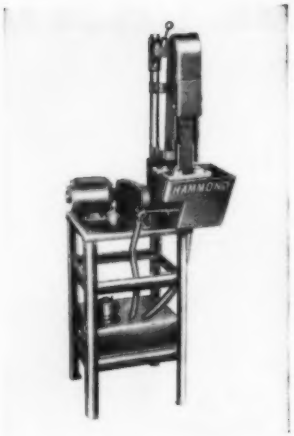
Cutting is accomplished by two cutting tools, the upper one operating at a high rpm. Cutting tools do not penetrate the metal, but shear the metal to the breaking point causing a smooth cut. Mild and stainless steel as well as all non-ferrous metal can be cut into intricate designs by unskilled labor after a little practice. A quick-locking centering device permits fast production of circular plates.

Assembly for Foot, Arbor Press For Marking of Cylindrical Parts

The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J., offers an assembly for a foot or arbor press that gives high-production marking of cylindrical parts. By using a V-block as a nest or stamping-block assembly in a foot, punch or arbor press, cylindrical and other shaped parts can be stamped with parts numbers or other identification at a fast rate.

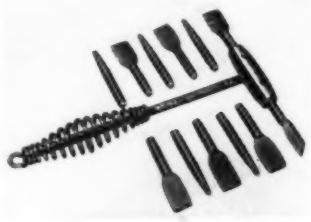
Portable-Type Rack Offered For Stacking Palletized Materials

A portable rack for stacking palletized materials is offered in standard and heavy-duty models by Equipment Manufacturing Co. Inc., 21550 Hoover Road, Detroit 5, Mich. The rack is said to accelerate order-picking and case handling by permitting the tiering of pallet loads to ceiling heights without tying up low-level goods. Adjustable rack underclearances are featured. Rack levels can be raised to accommodate high loads by extension posts.



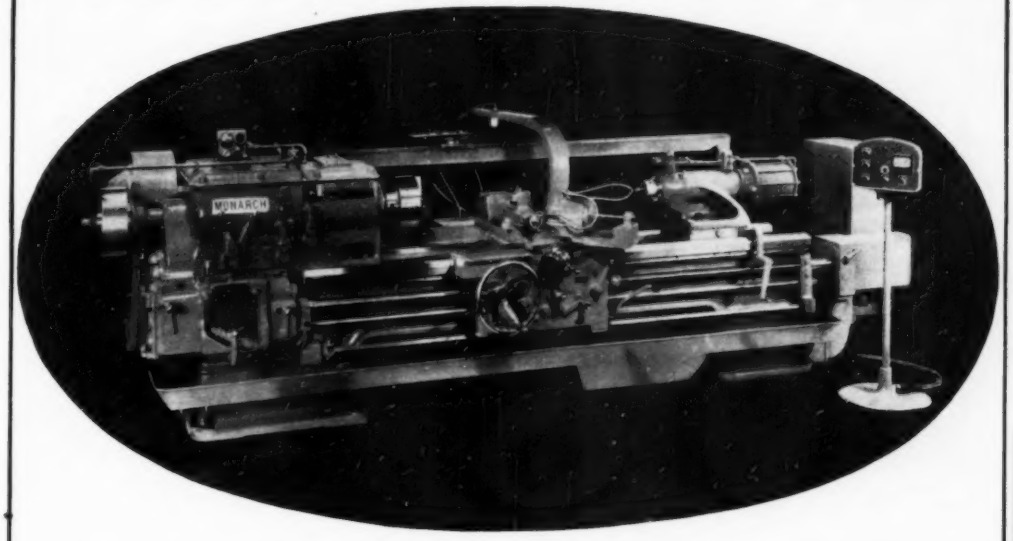
Wet-N-Dri Flexible-Belt Grinder For Wet Deburring and Finishing

Hammond Machinery Builders, Dept. GP-30, Kalamazoo, Mich., announce the Model V-2WP Wet-N-Dri flexible-belt grinder, especially suited for the wet deburring and finishing of plastics. It offers advantages of free belt, contour or platen finishing and takes an abrasive belt up to 2½-in. wide. The machine can be used for deburring, grinding, polishing, shaping, chamfering, squaring and other operations on ceramics, wood, rubber, glass, bone, ferrous and non-ferrous metals. Model V-2WP is shown with self-contained tank and pump unit.

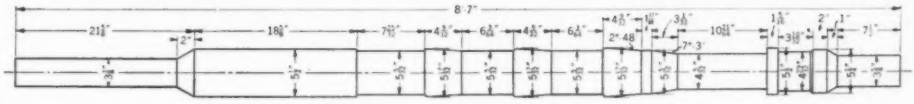


Chipping Tool by Atlas Welding Allows Replacement of Worn Bits

A weld chipping hammer which permits replacement of worn bits, called the Re-Bit, is offered by Atlas Welding Accessories Co., 707 East Lewiston, Detroit 20, Mich. No balls, springs, screws, or clamps are used. A simple taper locks both bits securely in the head in any position desired. The Re-Bit Tomahawks are offered in 12- and 16-oz. weights with a choice of Flex-o-steel or wood handles.



FIVE HOURS FIFTY-EIGHT MINUTES FASTER!



With Monarch's single-tool Air-Gage Tracing, this long shaft is turned complete in two hours 20 minutes. *Multiple-tool machining of the same part required eight hours 18 minutes.*

Note particularly the tough metal—the depth of cut—the 103-inch length. Air-Gage Tracing takes all these in stride. Moreover, it is equally applicable to the turning of multiple-diameter shafts or to the turning, boring and facing of contours to meet almost every practical application need. Nor does size of workpiece present any limitation—as witness the job illustrated.

Both an automatic machining cycle and automatic sizing are provided by the exclusive Monarch "Air-Gage Tracer". Speed and accuracy are inherent features: the motion of the cutting tool is controlled by a tracer mechanism operating directly on a master template or a master workpiece. Its air-gage-like action gives precision results never before attainable on tracer-controlled machines. Finish is improved, setup time minimized and tooling costs greatly reduced by this unique Monarch single-point cutting method.

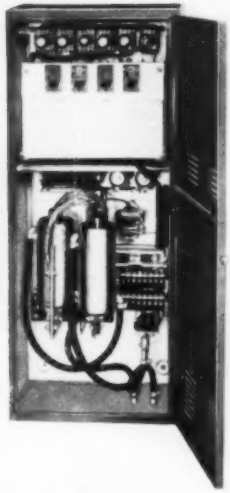
A constantly growing list of our customers is finding the way to reduced costs and improved quality through Air-Gage Tracing. May we show you how it will provide "peak production at a profit" in your shop?

JOB FACTS

Part—Extruder Shaft
Material—SAE 4150 heat-treated
Hardness—320 Brinell
Operations Performed—turn complete
Maximum Cut Depth—$\frac{3}{4}$"
Cutting Tool—Cemented Carbide
Machining Time—2 hours 20 minutes
Machine—20" x 144" Monarch Model M Engine Lathe, Air-Gage Tracer-Equipped

ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

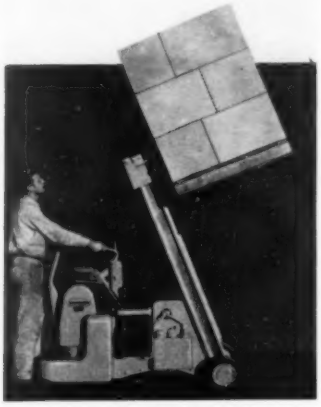
MONARCH MACHINE TOOL CO. • • • Sidney, Ohio



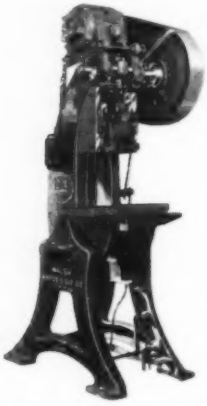
SPOTWELDER CONTROL is offered by Square D Co., 4041 N. Richards St., Milwaukee 12, Wis. The class 8992 electronic combination units include NEMA type 3B timers and ignition tube contactors for complete control of spot-welders. The timer uses no sequencing relays and will operate at repeat speeds of over 400 welds a minute

Fansteel Selenium Rectifiers For Charging Truck Batteries

Fansteel Metallurgical Corp., N. Chicago, Ill., offers a series of selenium rectifiers for charging 15, 16 or 18 cells of lead battery or 20 to 24 cells of Edison battery of the type commonly used in electric trucks. Operation is automatic in that the operator connects the battery to the charger and sets the electric time switch. Should there be a power failure, the battery is disconnected from the rectifier automatically. Battery chargers are made in four standard models.

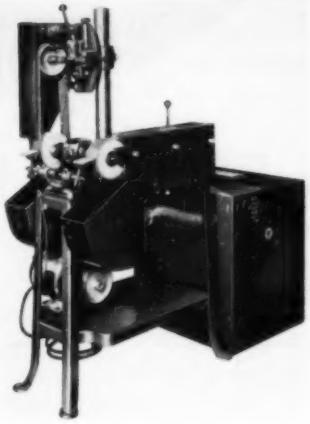


TILTING-TYPE TRANSTACKER including the suspended fork feature, is offered by the Automatic Transportation Co., 149 W. 87th St., Chicago, Ill. The battery-operated truck is available in two models, single lift, SCL, and telescopic, SCLT. Both units are compact, the SCL having an over-all height of 79 in. and a width over the load wheels of 32½ in. Comparable dimensions in the telescopic model are 83 in. and 42½ in.



Walsh Deep-Throat Punch Press For Trimming, Secondary Forming

The Walsh Press and Die Co., Div. of American Gage and Machine Co., 4709 W. Kinzie St., Chicago 44, Ill., offers the No. 12X O.B.I. flywheel punch press. The press is suitable for die-casting trimming operation and also for secondary forming operations on sheet metal as well as other punch-press operations. The press is available with 1½- to 4-in. stroke and 9-in. shut height with a throat depth of 6 in., which makes it adaptable for operations where bulky dies with low tonnage are required. Standard features included in the press are an alloy steel die-forged crankshaft which is precision ground and hand-scraped into special hard bronze bearings. The presses can be equipped with two-button safety devices with non-repeat attachment and with air ejectors. Delivery time is three weeks or less.



Grinding and Polishing Machine Employs Coated Abrasive Belts

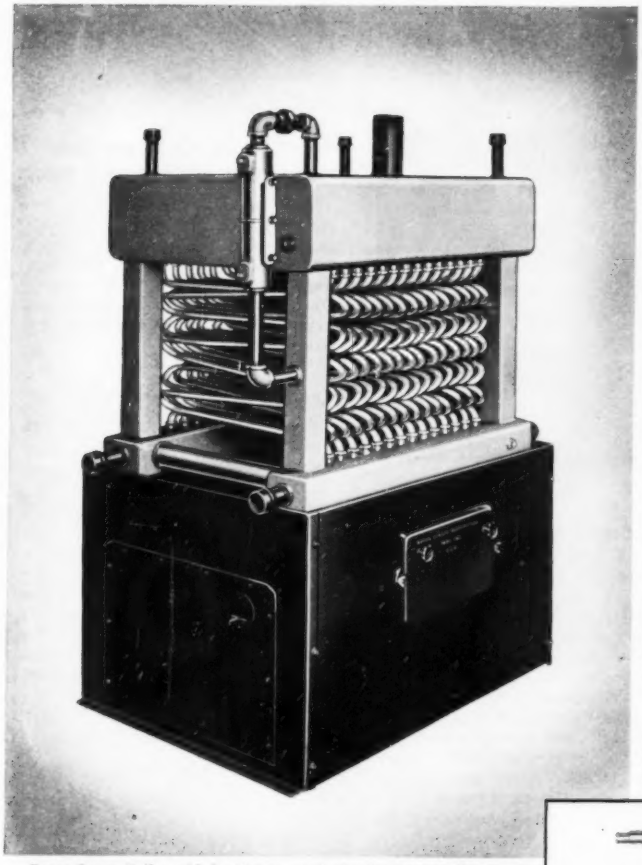
The H-type grinding, polishing and deburring machine is offered by the Delta Manufacturing Div. of the Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1, Wis. This Delta-Milwaukee machine using coated abrasive belts instead of wheels is a portable unit. It is available in four different models.

One of the feautres of the machine is its adaptability for the use of two different quality grit belts at the same time. The result is a speed up in the production of small parts that require more than one finishing operation. The machine can be converted into a buffing machine.

All four basic models consist of the arbor head, an idler unit, a straight-faced contact roll and abrasive belts. The general-purpose, square-stitched, medium-density, glued contact roll has steel bushings for the $\frac{5}{8}$-in. arbor.

COPPER TUBE

A VITAL FEATURE OF BRYAN BOILERS



Bryan Steam Boiler with housing removed, showing copper tubes. Bryan claims 75 pounds of steam in 15 min. from cold start, due to high heat conductivity of the Revere tubes. Also made in low-pressure and hot water models.

THE big feature of the boilers made by the Bryan Steam Corp., Peru, Indiana, is that they use copper tubes. Another important item is engineered design to meet the requirements of the fuel, whether gas or oil. Let Bryan tell the story:

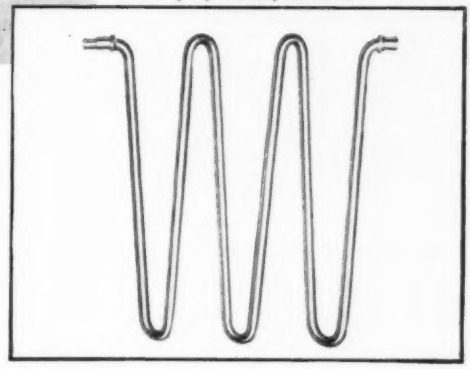
"The Bryan Copper Tube Boiler was started with a double-barreled idea. The first part of the idea was that boilers could be made more efficient by using copper tubes. Copper transfers heat many times as fast as cast iron or steel. Heat from a fire is transferred through copper tubes to water in record time, and in a Bryan Boiler with minimum heat loss through the flue due to the design.

"The second part of the idea was that if a boiler could be engineered expressly for gas or oil, the economy of operation would be such as to revolutionize the heating industry."

The first Bryan Boilers were a sensation when offered over 20 years ago. Today they are made in a number of sizes, from domestic types to 50 hp high-pressure units for industrial uses. Revere Copper Tube is used.

This is another illustration of a favorite Revere statement: "Copper is the metal of invention." Revere makes not only several types of copper tube, but also other copper and copper alloy mill products, and will be delighted to collaborate with you in such matters as selection of the most suitable metal, and fabrication methods to be employed.

Revere copper tube as fabricated by Bryan for boiler use. It is explosion-proof, because should it give after long service, water and steam escape harmlessly. A new tube can be installed in a few minutes by anyone handy with tools.



REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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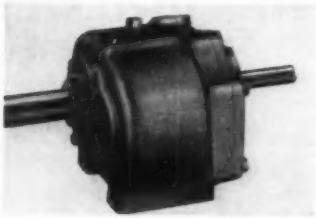
• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

Parts and Materials

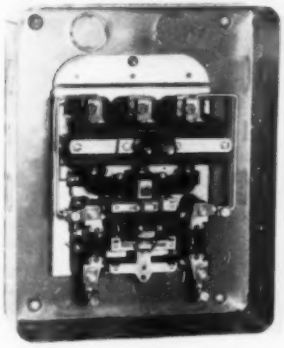


Two-Speed Automatic Transmission Will Supplement Two-Speed Motors

A two-speed automatic transmission can be used to supplement or replace two-speed motors, providing a broader range of speeds, and special ratios not obtainable with standard two-speed motors. Offered by Western Manufacturing Co., 3400 Scotten Ave., Detroit 10, Mich., the mechanism consists of two over-running clutches, one engaging in a clockwise, and the other in a counter-clockwise direction, so arranged that by reversing the motor, two speeds are provided on the output shaft without changing its direction of rotation. The two-speed automatic transmissions are built to handle 5-, 10-, 15-, 20-, 25- and up to 50-hp. motors.

Kato Series of Alternators Offers 300 kw. at 1800 rpm.

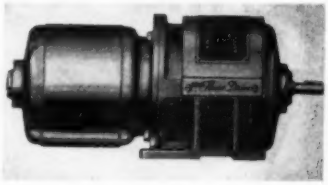
The Kato Engineering Co., Mankato, Minn., offers a series of alternators permitting a capacity of 300 kw., at 1800 rpm., 60 cycles. The machine is available at speeds of 720, 900, 1200, and 1800 rpm. It is available with direct-connected exciters on the high-speed designs, and top-mounted exciters on the lower speeds. The new machines are called the Katolight alternators.



MAGNETIC STARTERS are offered by Ward Leonard Electric Co., Mount Vernon, N. Y. Listed as Bulletin 4113 size 3 ac., the solenoid-operated starters are intended for use in general and special-purpose applications where across-the-line, non-reversing starting of polyphase squirrel-cage induction motors and single-phase motors is permissible. Starters are available with open-type construction for built-in or specialized controls or with NEMA Type I general-purpose inclosures. Maximum rating is 50 hp., 440-550 volts, 3 phase, 60 cycles

Cleaner and Phosphate Coating Provides Base on Ferrous Metals

A combination cleaner and phosphate coating compound is offered by Detrex Corp., Detroit 32, Mich. The coating material is for use on steel and other ferrous metals to provide a base for paint coating. Listed as Detrex No. 79, it is a yellow, non-corrosive cleaning compound and is in dust-free powder form. It is used in heated water solutions at low concentrations for the production of a light crystalline phosphate film on metal parts.



Hydraulic Electric Power Units Offer Built-In Gyrol Fluid Drive

The American Blower Corp., Detroit 32, Mich., offers a line of hydraulic electric power units with built-in Gyrol fluid drive. The new units are offered in sizes ranging from 1 through 20 hp. Each unit will have standard NEMA mounting bolt hole dimensions.

Coating for Rectifier Stacks Contains a Fluorescent Dye

A protective coating listed as "V" finish is offered by Vickers Electric Div., Vickers, Inc., 1815 Locust St., St. Louis 3, Mo. It is available as a standard finish on all Vickers selenium rectifiers. The coating is resistant to corrosion, salt spray, humidity and fungicidal conditions. The coating contains fluorescent dye permitting thorough inspection of the surface coverage of the selenium cells through the use of ultra-violet ray light.

Alvin All-Purpose Cold Solder Seals Joints, Cracks, Gaskets

An all-purpose cold solder called Lab-Metal is offered by Alvin Products, Inc., 20-22 Houghton St., Worcester 4, Mass. The solder is applied with an ordinary putty knife and fills blow holes, sandholes, surface blemishes and rough or porous places in metal castings.

The solder is said to harden in minutes to a strong permanent bond that can be sanded to a feather edge, ground and painted without requiring heat or special tools. It can be thinned with any regular lacquer thinner and brush painted or sprayed on. Lab-Metal is said not to shrink or crack and is waterproof and rustproof. The cold solder is available in pints, quarts, or gallons.

Gear errors **and** Gear noise

should be discovered long before the gears reach final assembly . . .

There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Productively Generate

SURFACE FLATNESS

MICROFLAT MACHINES

This cast iron valve plate for a refrigeration unit is finished on a double surface Microflat Machine to 8-microinch r.m.s. finish—optically flat and both sides parallel within 0.0001-inch. Production rate is 20 pieces per minute.

FINISH flat surfaces, on any material from soft copper to quartz or nitralloy, regardless of the shape or size of the part, in high production. Opposite sides of one or many parts are finished simultaneously on double surface machines,—productively produced to one light band of flatness and within one microinch r.m.s. surface finish. Recessed surfaces may also be finished on single surface machines.

Let us send more information at your request.

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8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

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55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

ROUND TABLE Discussion

DO MORALS AFFECT MORALE?

One might as well inquire if stealing affects honesty, because morale is surely the effect of the standard of morals observed, be this high or low.

While it ought not to be necessary for a foreman to give up his ordinary associates because of his office, neither should he, either as a foreman or a decent minded man, have promiscuous relationships with his female assistants. To do so is to take a mean advantage of his position and authority. It not only prejudices the girl's job and future but it is almost certain to lead to sapping of independent action and ultimately to the weakening of the foreman's control.

Supervisors of all grades from managers down to inspectors have sold their independence, each to his own particular Delilah. The ultimate end may be a divorce court, or worse. No firm can afford to tolerate such conduct because it will be costly to the company eventually. It is wiser to realize that low morals mean low morale, and that the name of any foreman who offends in this respect should be Johnny Walker.

J. E. Powell
Lindum, England

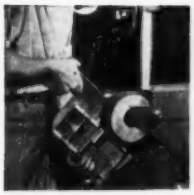
•

FACE-TO-FACE OR BACK-TO-BACK?

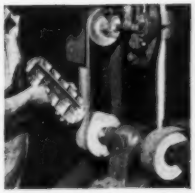
Not all employers have the knack of standing before their employees and addressing them properly. The presentation is either too brief or too long. Often it is too stiff—or over the heads of the men (which they will suspect as double-talk). These employers should adopt a different approach or hire a skilled go-between. The employer can develop good relations with employees by talking directly to them only if he has the talent.

A few years ago, I attended a convention addressed by Mr. Jack, then president of Jack & Heintz. He climbed up on the platform dressed in a sport shirt, without tie or jacket. His topic was "corporation taxes." Only a man with Mr. Jack's personality would attempt and succeed in addressing this audience as informally as he did.

The employer who imagines that



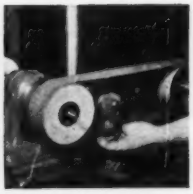
Dust chutes cause no interference with large pieces.



Guard raises, or swings clear, to expose any part of belt.

Platen in up-position provides flat working surface.

Easily made into a buffing machine, for many jobs.



With platen down, pieces are worked from under belt.

new!

Low cost! Portable! Takes little floor space! Does many metal-removing operations formerly requiring heavy, expensive machines!

DELTA® *Belt* Grinding, Polishing, and Deburring Machine

Can be used to do all this—and more!

- Clean out slots
- Remove flash in corners
- Remove fins
- Smooth up crowns
- Remove nibs
- Remove parting lines
- Chamfer corners

$130.75

without adjustable guards, dust chutes, motor, switch, or switch rod.

Price subject to change without notice.

Available in models to suit varying needs
See Bulletin AD369

DELTA MILWAUKEE®

You speed up flashing, grinding, cleaning, and polishing, with this new Delta *Belt* Grinding, Polishing, and Deburring Machine. You save time, labor, and material.

In this condensed unit on a welded steel stand, you get a production machine at low initial cost. With accessories to meet your particular requirements, it does hundreds of different jobs.

There are no set-up wheels to bother with; no grinding wheels to dress. Instead, you use coated abrasive belts that are inexpensive, long-wearing, quick and easy to replace.

The Delta *Belt* Grinding, Polishing, and Deburring Machine is carefully engineered for long, trouble-free service. Delta quality features assure you of that: Preloaded, lubricated-for-life ball bearings. Precision-bored bearing seats. Dynamically-balanced pulleys. All-around rugged construction. Delta Dust Collector available for use with this unit protects workers' health and expensive machinery.

Make metal-removing fast and economical. Put Delta *Belt* Grinding, Polishing, and Deburring Machines to work for you on your production line—and in your inspection department, to clean up imperfections on the spot.

Have your nearby Delta distributor show you this new machine. Send coupon for free Bulletin AD369.

Ask your distributor about easy time-payment plan!

DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

TEAR OUT COUPON AND MAIL TODAY!

DELTA MANUFACTURING DIVISION
6088 E. Vienna Avenue, Milwaukee 1, Wisconsin

Send me free copy of Bulletin AD369.

Name.....

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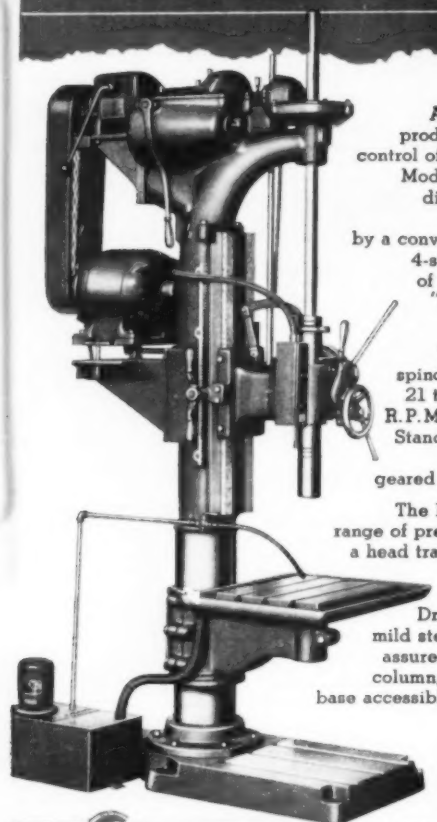
City.....(.....) State.....

WM-25

NOTICE

The New

SIBLEY MODEL D DRILLING MACHINES in 24" and 28" SWING



An operator gains greater productivity from the ease of control offered by the new Sibley Model D. The V-belt drive is direct to a 4-speed geared transmission, controlled by a conveniently located lever. A 4-station switch at the front of the machine includes an "inching" button to facilitate changing speeds.

Three optional ranges of spindle speeds are available: 21 to 365 R.P.M.; 25 to 419 R.P.M.; and 37 to 650 R.P.M. Standard equipment includes automatic spindle stop; geared power feeds; back gears.

The Model D handles a wide range of precision drilling jobs with a head travel on the hand scraped column of 25" and a spindle feed of 11". Drilling capacity is 1¾" in mild steel. The heavy table arm assures rigidity and swings on column, to make the machined base accessible for a working surface.

Model D-24 Drilling Machine is illustrated complete with coolant pump and fittings, electrical reversing, 5 H. P. motor, magnetic starting switch, and rectangular oil groove table.

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he is a great speaker running for president or a lawyer pleading a famous case should stay away from the rostrum. A man standing before a crowd, shouting and waving his arms, is admired in Europe but in America, the smiling, calm, to-the-point speaker is preferred.

The employer who feels uncomfortable when talking personally with his men should shy away from public appearances.

Frank J. Zarnowski
Rutherford, N. J.

•

MEN ONLY?

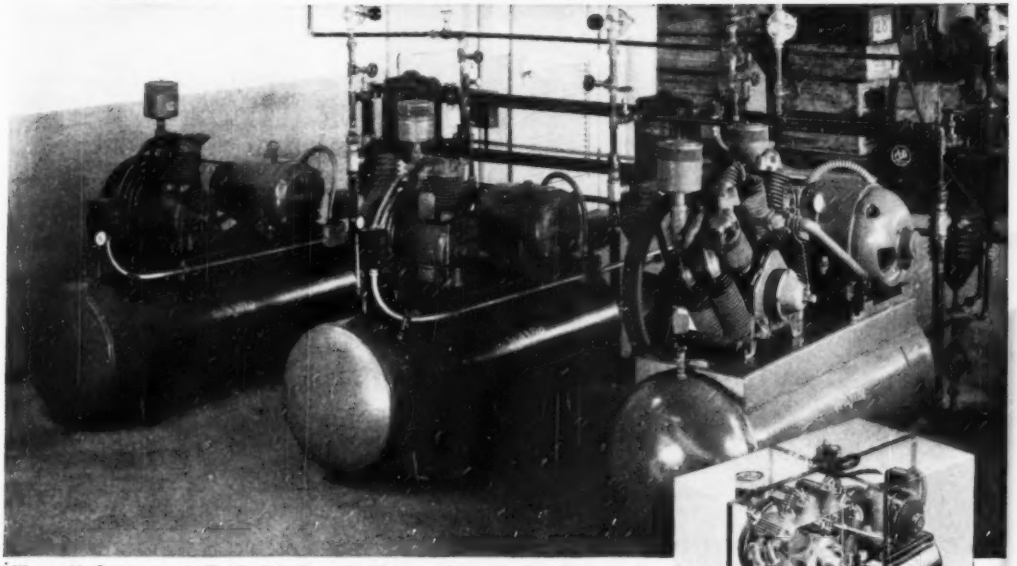
The "weaker" sex definitely has a place in metalworking production. Anyone who has had the experience of working with women in productive work during the last war knows they can stand the gaff. All things being equal, their production compared favorably with that of their men co-workers, and disturbances they may have created in a mixed crew were noticeably absent.

After each emergency labor shortage, the receding tide of women workers on productive jobs has usually left some stragglers still at their jobs. Social attitudes have changed somewhat, and more women are seeking employment outside the home.

Men workers have often resented the invasion of women on so-called men's jobs because they felt that women were unfair competitors and displaced men.

However, in spite of the general opposition to women in industry, the shortage of manpower during World War II and the need for peak production brought women into factories to a greater extent than ever before. About 2,500,000 women were employed in war industries at the end of 1942. This influx of women presented significant industrial relations problems involving the need for re-engineering jobs and changing working conditions. On the whole, it was found that there were very few jobs performed by men that women could not do with changed conditions and methods. Women workers were found to be dexterous with their fingers, and able to adapt themselves to repetitive, monotonous work. They could also do very precise work, requiring the use of a micrometer and measuring to close tolerances. In general, women have been found to be particularly well adapted to certain repetitive jobs and able to handle skilled jobs after training, and work to precise tolerances. Where women replace men

"NEVER WITHOUT AIR"



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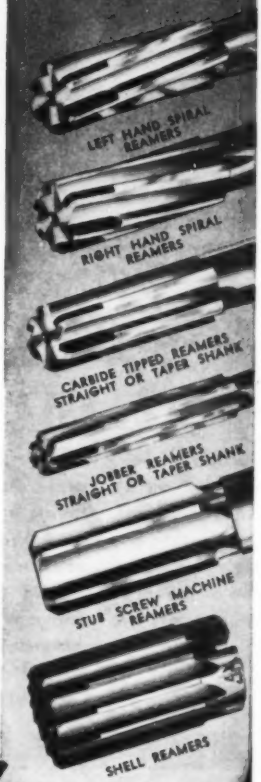
LEFT HAND SPIRAL REAMERS
RIGHT HAND SPIRAL REAMERS
CARBIDE TIPPED REAMERS STRAIGHT OR TAPER SHANK
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STUB SCREW MACHINE REAMERS
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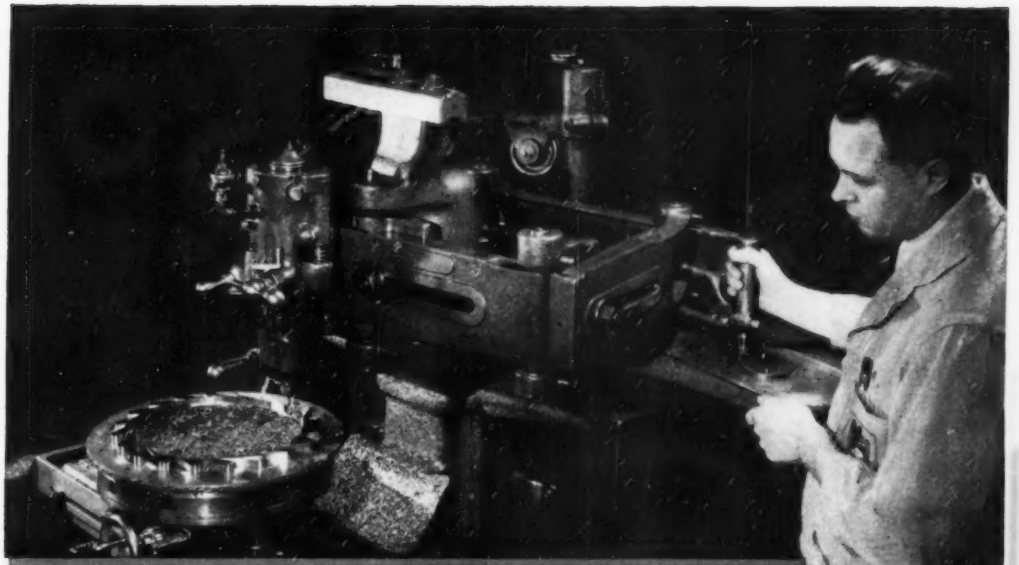
and produce less quantitatively and qualitatively, the following general reasons may apply: Women workers are not as flexible as men; they cannot be transferred to heavier jobs. Women cannot work as long hours as men (often by state law). They are more temporary; will get married and do not fit into the permanent future of the company. Women haven't as much physical reserve as men in case of breakdowns. Poor attendance, sickness, and in many cases less dependability, leading to high labor turnover, are characteristic of employment of women in many plants. Additional washrooms, rest rooms and locker rooms, and uniforms are needed when women are employed. Longer lunch periods, rest periods and personal time are needed. Women workers are more emotional than men; therefore, better and additional supervision may be needed. Greater safety care is needed when women are employed in the shop. However, it is not believed that women are more accident-prone than men, but there are several types of accidents to which women seem more susceptible, such as getting caught in machinery by their hair or clothing. The cause of these accidents is being removed by the requirement that women dress safely for work. On the whole, however, it has been found that women are more cautious than men and less prone to recklessness and horseplay.

Man-made tradition alone limits the field in which women may work, though there is an unlimited field for men. In our modern day it may indicate that man is compensating because of a fear of loss of self-esteem if it should be discovered that a woman can do his job as well as, or better than, he can.

From personal experience I have found that women workers in the shop are more likely to brood and smoulder over small grievances than to make an issue of them. This may spring from the fact that ordinarily they are more conservative and orthodox in their general views in life and, in particular, in matters pertaining to security. Women will seldom quit in a fit of anger, but many small problems will have to be worked out continually to keep them free from grievances.

In types of work where deftness and patience are an important factor, such as in the fabrication of small articles and inspection, women are frequently more effective than men. There are administrative drawbacks to having a limited number of women employees in a plant in which the majority of workers is men, but



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This is just one example of cost saving made possible with Gorton Tracer Controlled Equipment which includes die and mold duplicators, pantograph machines, super-speed vertical mills and plain type horizontal mills. Gorton features high spindle speeds, wide versatility and high precision.

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MATERIAL — Stainless Steel

OPERATION — Profile 20 turbine blades ½" deep from the solid in a circle 13.155" outside diameter.

FIXTURES — Gorton Rotary Table and 5 times-size master cut from sheet iron.

CUTTERS — 2 carbide 2-flute and 2 H.S. Steel 4-flute.

TIME — 10 hours; Finish better than 30 micro inches. Time Saving over any other method 60 hours or better.

REMARKS — Tooled for Automatic high production work, the time would be cut to 4 hours.

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their extra efficiency on the work which is most suitable for them goes far to offset this.

As far as supervision is concerned with women workers, I have found through experience that the foreman is wise to use a very personal approach as the best way to keep them efficient, productive and happy. He should be especially free with compliments and praise. It has also been my experience that while women workers are subject to more emotional flurries on the job than men, they rarely "blow their tops" with the violence a man will when deeply affronted. It apparently is easier for them to swallow their pride. Handling women workers requires greater skill and diplomacy, but good bossing pays off with them even more than with men. They become wonderfully loyal and anxious to please. Treat them with sympathetic understanding and as persons and they will prove good workers.

Harry Kaufman
Philadelphia 26, Pa.

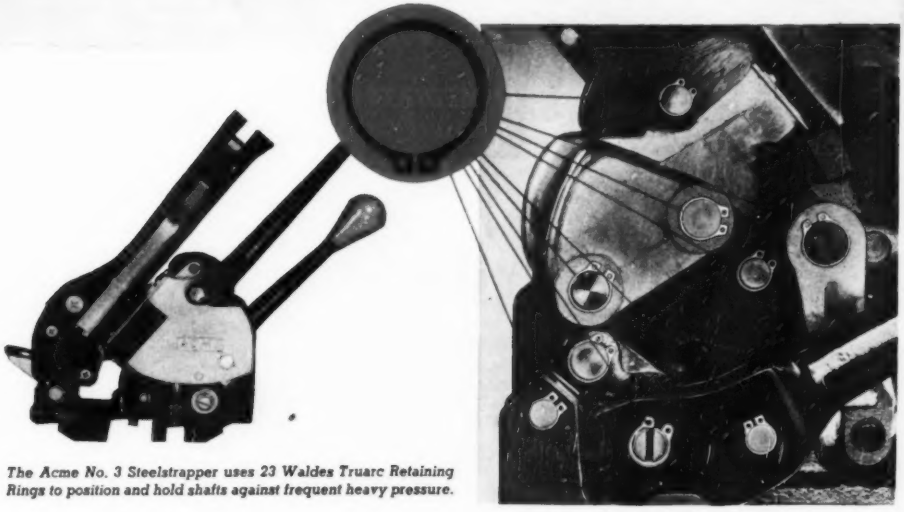
•

The question of whether women have a place in metalworking production has been answered to the satisfaction of many of the leading plants in this country and abroad. Three years after a war that called them to the production line, a goodly number are still employed at bench, lathe, and drill. It follows that they must be giving a good account of themselves or they wouldn't be there. Given proper supervision, the mixed crew can pull together just as smoothly and effectively as the all-male aggregation; it simply boils down to the proper exercise of discipline and the force of good example. The conduct or morale of a working force is at all times the reflection of the morale pattern set by the supervisor.

From my own experience, I find that women workers do better on light repetitive work such as drill-press, light milling and grinding, and small lathe work that utilizes their natural manual dexterity without calling for any great display of mechanical know-how. Very few of them have the background required to set up their own work, but with a good setup man to take care of that end of it, most women operators can be depended upon to turn out work accurately and speedily once they acquire the "feel" or rhythm of the operation.

As regards toolroom work (very little of which really comes under the heading of "repetitive"), we are on different ground. I can only recall

23 Truarc rings permit changeover to centerless grinding savings



The Acme No. 3 Steelstrapper uses 23 Waldes Truarc Retaining Rings to position and hold shafts against frequent heavy pressure.

"The use of Truarc Retaining Rings permits centerless grinding of pins instead of plunge-grinding. This eliminates the problem of taper and reduces the required tensional tolerances of these parts," reports Acme Steel Company of Chicago. "Furthermore, use of Truarc rings gives the Steelstrapper smoother lines by eliminating unsightly projections. This results in a more streamlined housing, a definite sales advantage."

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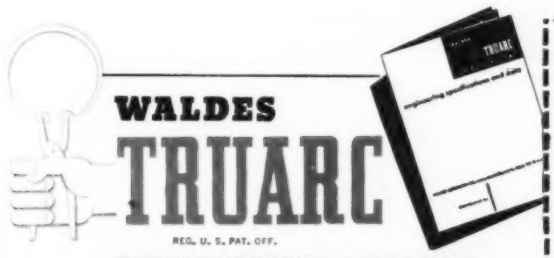

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one instance in which I saw genuine tool work being performed by a member of the so-called "gentler sex." This was back in '32, in a shop employing about 50 skilled toolmakers. This lady was a holdover from World War I, a widow of one of the former employers. During the years she had acquired a moderate amount of skill in jig and fixture work. She was respected by the foreman and men, principally because she asked no favors from any of them, being a competent "workman" in her own right. There may be other instances where women are doing tool and die work, but in my opinion they are few and far between. The fact that it takes several years to equip the average toolmaker with the knowledge necessary to practice his trade, makes it all the more difficult for women to "break in" at this exacting work.

Light assembly work at the bench is admirably suited to the feminine touch, as well as inspection of small parts. It has been my experience that women seem to excel at repetitive work of this nature, where men are likely to become bored by the monotony of making the same set of motions day after day.

Finally, with regard to the question of "standing the gaff" of production, especially on piecework: During the late unpleasantness with Hitler and Tojo, I have seen women come to work on the afternoon shift after getting breakfast and lunch for husband and family, shopping, and the usual run of household chores. Not only did these fulfill their piecework quotas, but also in many cases they exceeded them—this on a 6- or 7-day working week.

Should the occasion arise there is no question in my mind about the ability of the ladies to meet it again. Men only? Save the men for the jobs that require that little extra brawn or "know-how."

Robert S. Alexander
Greenville, R.I.

•

Ed must belong to that old school whose belief was that the only place for women was in the home.

It's time for him to wake up, however, for this kind of thinking is outmoded, inasmuch as women are proving that a day's work in office or shop can be accomplished regardless of whether the worker happens to be male or female.

At one time, women were prevented from becoming medical doctors and practicing the profession solely because of their sex, but they proved to a doubting and skeptical

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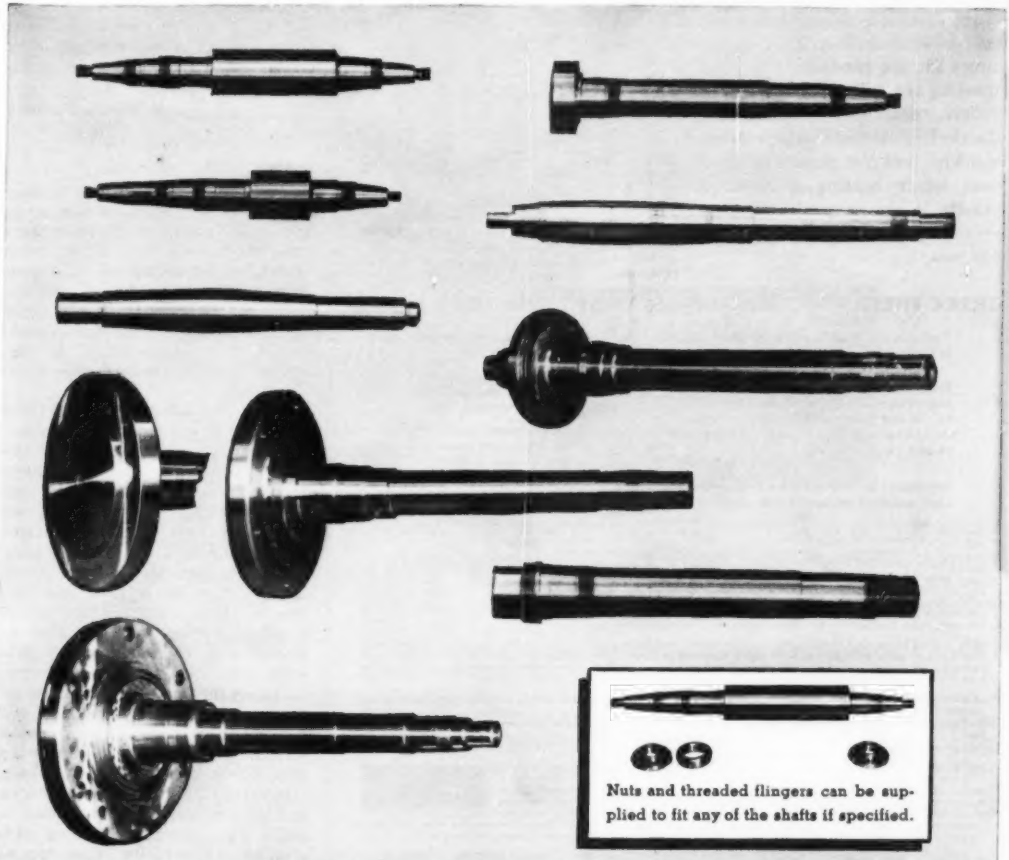

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Cooley VK-6 Electric Furnace with automatic heat control and selective power modifier. Typical work profitably heat treated in this Cooley Furnace includes gears, bushings, gages, tools, dies, punches, etc.

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Tool and Die Heat Treating — Hardening and tempering.

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MAX. TEMP.	1850° F.			1850° F.			2000° F.		900° F.	1200° F.
AMPERES	14.8 at 230 v.			19.6 at 230 v.			20.2 at 230 v.		17.5 at 230 v.	17.5 at 230 v.
WATTS	3400			4500			4650		900 Max.	1200 Max.
MODEL*	MH-3	VH-3	MK-3 VK-3	MH-4	VH-4	MK-4 VK-4	VK-5	VK-6	ACL	ACH
PRICE	200 00	230 00	250 00 260 00	295 00	325 00	345 00 375 00	420 00	340 00	385 00	415 00

* M models complete with hinged door and hearth plate. V models have counterweighted vertical lift door. K and AC air circulating with built-in fan; models include Selective Power Modifier for input control to correct temperature lag.

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Enclosed Panel containing controlling pyrometer, line switch and fuses with steel stand completely wired, range upward from ..... $293 00.
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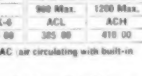

SIMPLE HEAT TREATING INSTRUCTIONS — Cooley Engineers have prepared simple heat treating instructions which are so designed that anyone can perform heat treating, hardening, tempering, drawing, and annealing operations on a wide range of steels and other materials. They are sent with each Cooley Furnace or are available upon request.

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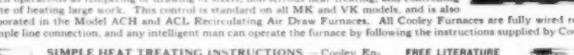


world that they were on an equal plane with male doctors as far as ability was concerned.

The changing pace of the world has accelerated woman's step from the home to the office, and today there are few jobs that cannot be as satisfactorily filled by women as by men.

The recent war proved women's merits as producers; war's end will not detract from their ability.

Men and women work side by side in other businesses without the distraction which Ed is afraid of; namely, that their sexual attributes are flaunted. But he might as well resign himself to the wider introduction of women in industry, for more and more of them will be entering not only the tool industry but other classes of work heretofore exclusively man's domain.

Milton E. Sussman
Brooklyn 20, N. Y.

•

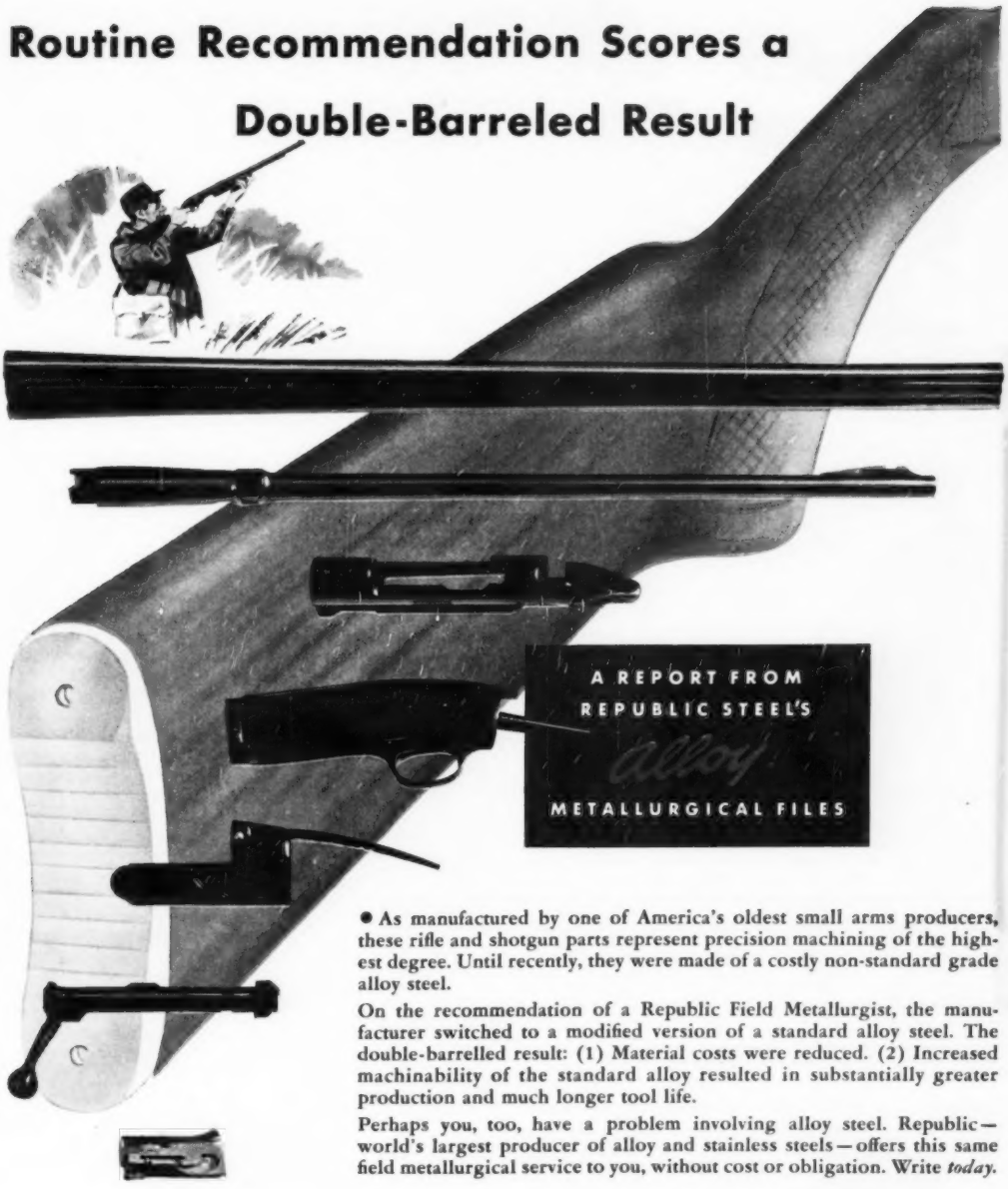
During the first World War in England, when the situation was acute and most young male toolmakers had either volunteered or been called up for service, a huge gun plant made an agreement with the union to train girls as toolmakers for the duration, with the stipulation that the girls would be dispensed with one month after Armistice.

From among the large number of female employees in the plant about 60 were chosen. The cream of the crop to be trained as toolmakers. These girls spent two hours a day learning how to read blueprints, use micrometers, vernier height gages, indicators, and all the other tools necessary in toolroom work. Questions were invited and answered. One top-notch toolmaker, a married man, was installed as tutor to each four girls, and all girls were put in special blue uniforms.

During the first month no atttempt was made to obtain production, but production was started the second month. At the end of nine months two thirds of the girls had been transferred to direct toolroom work and only seven of the 60 failed to make the grade in 15 months after starting. Eventually this special toolroom for tools and gages was totally manned by girls, with the exception of a male supervisor and his assistant.

The same policy was followed in one large breech-block department with great success. After all, if boys can be trained to do such work, why not girls? Medical opinion is that they are able to withstand

Routine Recommendation Scores a Double-Barreled Result



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On the recommendation of a Republic Field Metallurgist, the manufacturer switched to a modified version of a standard alloy steel. The double-barrelled result: (1) Material costs were reduced. (2) Increased machinability of the standard alloy resulted in substantially greater production and much longer tool life.

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Whether you are designing a new gear or rebuilding old equipment, play safe by selecting the Ampco alloy and form that fit your needs. Get a gear that stands up under impact and fatigue with unbelievable resistance to wear—that outlasts any gear on the same job. Ask your nearest Ampco Field Engineer for recommendations and assistance.

SAND-CAST AMPCO METAL—Massive 2416 lb. worm gear which plays a critical part in the "screw-down" mechanism of a giant size rolling mill.

CENTRIFUGAL CASTING (including teeth)—Used as a boom hoist gear on large excavating shovel. Withstands wear, fatigue, shock, and abrasion caused by dust, dirt, and loading.

EXTRUDED AMPCO METAL—Tiny drive-gears and level-wind gears for a fishing reel; designed to give perfect performance and service under widely varied conditions.

WELDED ASSEMBLY — An Ampco centrifugally-cast ring welded to a mild steel hub and web with Ampco-Trode 10.

***CONTINUOUS-CAST AMPCOLOY**—Bronze rim with die cast aluminum hub and web. This eccentric gear is proving its value by giving long, satisfactory service in many automatic home washers—and at a savings to the manufacturer.

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greater hardship and privation than men, and if they could stand the gaff in 1914, they certainly could today with all the advancements in working conditions which have been developed in the meantime. Moreover, the present generation is certainly healthier and physically and mentally superior to the preceding one.

Certain drawbacks are involved in employing women, however. Girls will stay out every so often on Monday, particularly if they are only working for extra money. Many married girls have a bad absentee record because they can always fall back on their husband's income, while a married man must keep his nose to the grindstone in order to support his family.

There is no justification to the statement that girls cause a disturbance. You can introduce a batch of girls into a shop and if they are dressed in the usual sloppy coveralls with their hair stuffed into hats, as is commonly done, I doubt if anyone would notice them—even though they were the most alluring, sweet-smelling and attractive girls imaginable. Frankly, few girls look good in men's clothing, and in men's pants they all look terrible.

On the other hand, just allow one smart young, attractive girl with shapely figure dressed in the usual feminine way, and watch 98% of the male employees find it necessary to talk to her and help her on any job she may be doing.

In my opinion, all the developments in methods engineering, equipment and shop conditions generally have removed any reasons there might have been while female toolmakers should not be used in emergency. They would be just as efficient as the males and more conscientious.

Arthur Silvester
Niantic, Conn.

•

Ever since Adam was a yearling, we have had men and women associated in all walks of life. Now women are coming more prominently into manufacturing plants. During the early years of the century, shops were rough places where real beef, rather than brains, was commonly required to get objects properly placed, and all sorts of rollers, bars and cuss words were essential to the operation. The same general rule applied in most shop work—and there was no place for a lady within hearing distance.

Nowadays, however, with elaborate mechanical handling equipment

BARNESDRIL
PRODUCTION UNIT MACHINE

Taps 3360 holes per hour with *Capacity* to spare

★ Operating at 28 cycles per minute, this BARNESDRIL High Production Unit Machine automatically taps and ejects ¾" threaded conduit terminals at the rate of 3360 pieces per hour. Actually the timed cycle control is adjustable to the capacity needed to meet production requirements.

Continuous operation and automatic cycle timing control combine to give greatly reduced cost per piece and increased output on these small parts, providing an unusual competitive advantage. Nonproductive time for loading, unloading, or changing fixtures is eliminated.

On similar work, including drilling, reaming or boring as well as tapping, this same automatic cycle can be arranged with automatic loading to further reduce production time. Speed of cycle can be selected to meet even faster production requirements. Why not send us job specifications of parts requiring fast, *low cost* machining in your shop for production estimates. BARNESDRIL representatives will be glad to show you actual savings which can be obtained.

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No. 1 Dial Comparator. This model has a table which is adjustable for height. The lever at left of dial is pushed down to lift the indicator rack spindle. Any Ames Indicator can be attached, but the one regularly supplied is Model 202 with dial numbered 0-100, reading .001", having .250" range.

No. 13 Dial Comparator. The 8" x 8" cast iron base can be fitted with locating fixtures and V-blocks. The bracket supports any Ames Indicator, but regular equipment is Model 202 with dial numbered 0-100, reading .001", having .250" range. Bezel and dial turn to locate zero beneath pointer.

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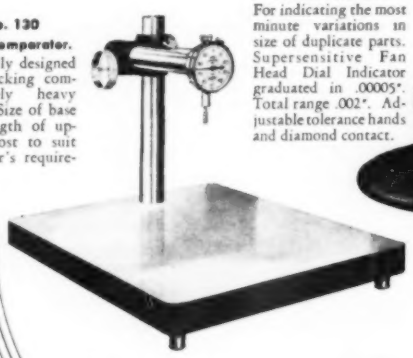
No. 130 Dial Comparator. Especially designed for checking comparatively heavy parts. Size of base and length of upright post to suit customer's requirements.



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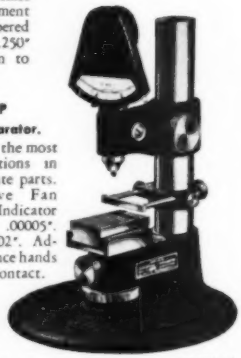

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and general use of brains rather than brawn, the atmosphere in the average shop has quieted down considerably. If one looks at industry at large, there are many plants where all materials and products are handled entirely by means of pushbuttons, levers and pedals, so that the physical requirements are not so heavy either. During the late war, female acetylene welders became skilled on many aircraft parts, and even before that thousands of armatures for small motors, magnetos and many small electrical parts were produced by women. Undoubtedly there are many operations which women can perform as well or better than men, and it is advisable to anticipate their use at any future emergency. So why not try them out now?

F. H. Stebbins
Worcester, N. Y.

•

I understand from the lessons I learned as a youngster that when the Head Designer made Eve he is supposed to have taken a rib from the ticklish side of the pioneer metal-buster and, with a mysterious wave of the magic club, given it a few chiropractic treatments and behold —there stood a coverall-clad side-wheeler in all her annoying glory. Whether the new model had a pair of 24-in. outside calipers in her hand is something that history does not record.

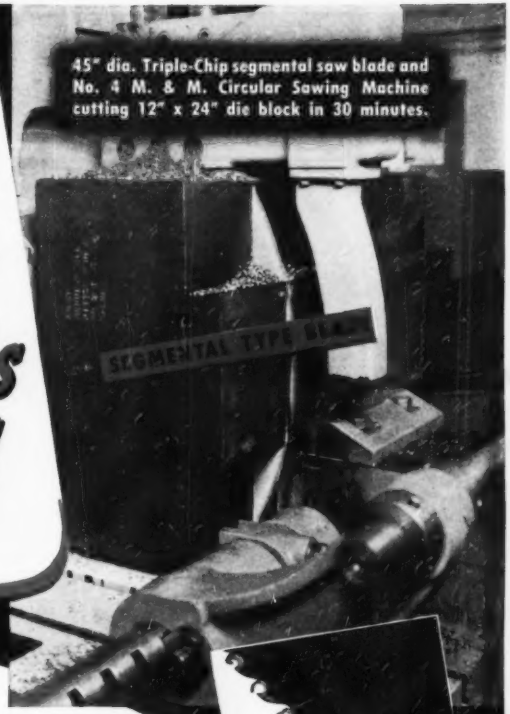
The delicate flower has traveled a long way since the bottle of cutting compound was broken over her extensive derriere some seventeen-quintillion years ago and, as a climax to her persistent efforts, has finally infiltrated into bewildered industry. Woman is just as much a part of it today as is the roof over the shop.

Take note of the cunning with which she managed to climb into manufacturing prominence—first she concentrated on legislative power, and poor man, unable to withstand the determined barrage any longer, finally gave her the vote. In time she wormed her way past the keen-eyed employment manager and landed up in the shop, caught on to the working of the time-clock in short order, then started in to make her presence known.

Had her entrance into industry been sudden instead of gradual it would have thrown the country into one of the worst panics in history. The disturbing influence of her presence is felt now and then notwithstanding. Ever since the original sucker in the Garden of Eden slipped his lost rib the golden de-

Only M & M builds ALL 3: CIRCULAR SAW · SAW BLADE · BLADE GRINDER

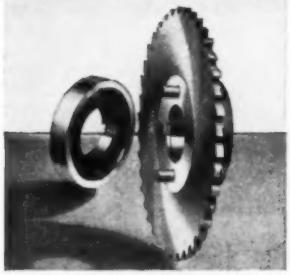
The MOTCH & MERRYWEATHER Triple-Chip Saw Blade Makes Difficult Jobs Easy!


45" dia. Triple-Chip segmental saw blade and No. 4 M. & M. Circular Sawing Machine cutting 12" x 24" die block in 30 minutes.
SEGMENTAL TYPE BLA

Motch & Merryweather Triple-Chip Blades cut ferrous and non-ferrous metals of any size or shape to accurate lengths—uniformly. Ends are clean, square, burrless. Amazing speeds yield five times as much production as any other practice. Mill-type finish eliminates second operations. Heavier chips and feeds are attained without blade breakage. *Other advantages:* repeated, inexpensive regrinds; maintenance virtually nil; power conserved; longer tool life; big savings in floor space and overhead. M. & M. Triple-Chip Saw Blades from 11" to 70" diameter are segmental with many distinctive features.

Only the M. & M. Triple-Chip Method gives you exclusive, important advantages.

Solid Type Blade for Cut-off and Milling Operations



Triple-Chip slitting blade (dual drive).

M. & M. *solid* blades 3" to 18" diameter, of high speed steel, with a range of rake angles and tooth spacings, will meet your exact needs. Triple-Chip features insure high production and unmatched accuracy. M. & M. saw blades have taper ground sides for clearance and a flat hub for mounting. Standard tooth spacings are furnished without extra cost. A standard line of milling saw blades is available. Any arbor size can be accommodated. Standard blades are available for plastics and other non-ferrous materials.

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The other copy gives the Accounting Department identical data for cost records. There are no delays. Both are immediately available at the end of operations or shifts.

McCaskey Control in the tool cribs has stopped the disappearance of tools, loss of time by employees at the crib and idle time of their machines, tool breakage and excessive inventories, and has brought numerous other real savings.

Write for a demonstration of this "McCaskey Simplification" and suggestions for applications to your particular needs—or send for descriptive folders. No obligation, of course.

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McCaskey Systems Ltd., Galt, Canada The McCaskey Register Co., Watford, England

licious, man has repeatedly made mistakes. In his effort to please he has inadvertently encouraged our timid Rita to accept a job in a plant where she sits on her five-by-five extemporarious while she yacks with pneumatic-hammer facility throughout the long hours. Occasionally she'll lay aside her small automatic screwdriver, pick up her mystery bag and withdraw therefrom a file with which she'll proceed to piddle around the edges of her well-shaped nails.

Ah me! It's too late to complain now, fellows—she's in to stay. Man is rugged by nature and can take it on the chin. He'll suffer from industrial adhesions at times and will become accustomed to that which he has unwittingly brought upon himself. Let's give woman credit for one advantage: She has been the means of establishing smoking rooms and primp parlors. Would I be too dreary of thought to anticipate special laundry salons to which our industrial sparerib can repair to elutriate here delicate pinkies?

Jack Everett
San Francisco, Calif.

•

REST FOR THE WEARY

Stools should be placed by each machine and along the bench. That is, except the lathe! The lathe is the only machine tool that must be operated from a standing position. Leaning on the tailstock is a more preferred position than sitting. The controls of the lathe cannot be operated in a sitting position, except on certain production setups.

Even in turning large or long pieces at slow speeds, the controls follow the cut; if the operator is sitting down, he is in a bad position to watch the cut and operate the controls in case of an emergency.

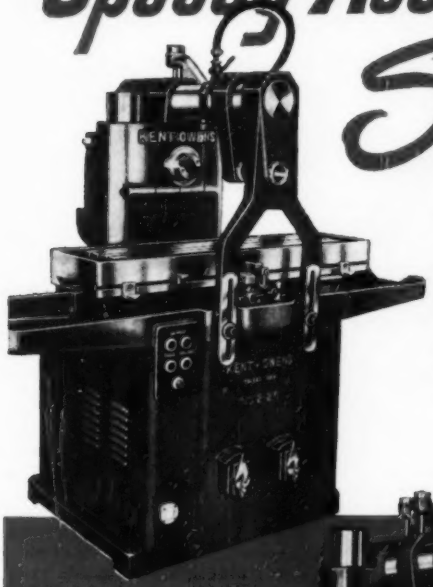
The only machine we were permitted to sit alongside was the shaper. Controls could easily be handled from a sitting position. The work table was so low that a seat was necessary to prevent a "broken back."

If a man sits beside a machine and merely watches the work spin around, sooner or later he will become sleepy and logy. Standing or leaning will keep him alert or at least in a position to act promptly.

Where a stool can be used, the operator should be encouraged to utilize it. Continuous sitting is also monotonous. Alternating standing and sitting will lower fatigue.

Frank J. Zarnowski
Rutherford, N. J.

Speedy Accurate Milling Saves Labor!



On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

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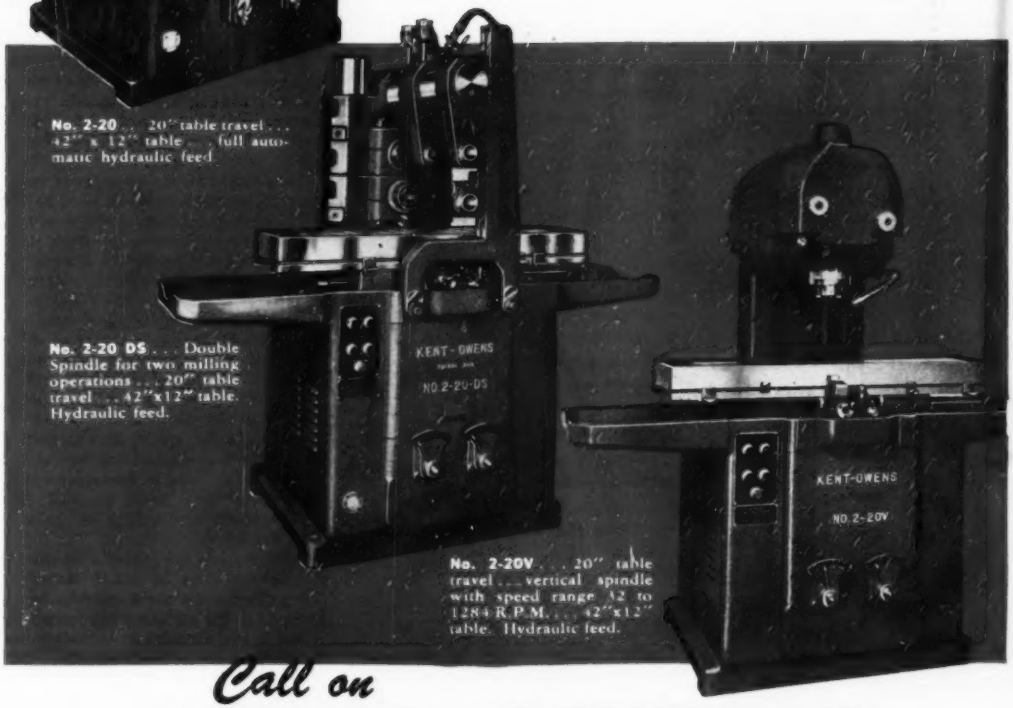

No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 2-20 DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42"x12" table. Hydraulic feed.

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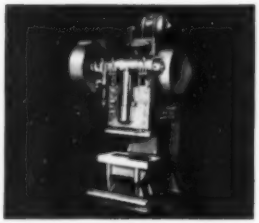
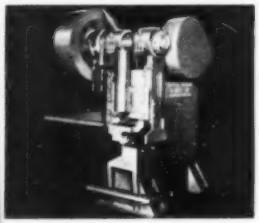
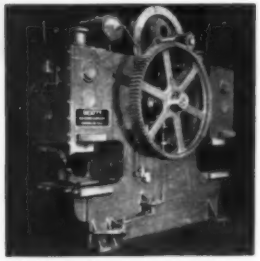
BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



BEATTY Single End Punch available in capacities up to 200 ton.



BEATTY Single End Bar Shear available in capacities up to 300 ton.



BEATTY 200 ton Double End Toggle Punch.

"BLACK SHEEP" among engineers is the fellow who is *fully* satisfied with the way *anything* is being done. Not so with Beatty engineers! Our motto is that, "There's a better way to do it." And we have helped find that better way for hundreds of heavy metal working operations — punching, coping, shearing, forming, pressing, flanging, extruding, V-bending. Our broad problem-solving experience qualifies us to make expert recommendations on *your* problem, no matter how intricate. If you have a specific problem, if you are not fully satisfied with present production, call us in. We may very well have the answer.

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"Quotes"

Broader Handling Studies Cut Distribution Costs

"STUDIES . . . of distribution . . . are going to be more common in the future than they have been in the past," predicted H. B. Maynard, president, Methods Engineering Council, speaking at the ASME Materials Handling Conference in Philadelphia recently.

"Materials handling goes on from the very start of a process until the finished part is in the hands of the ultimate consumer. This means that there are many, many materials-handling problems which exist outside the plant. These problems may be more serious in their cost-increasing effect than the internal handling problems," the speaker stated, in explanation.

"As competition is becoming keener in this post-war period, cost reduction work in the whole field of materials handling seems certain to be intensified. Recently, for example, a whole industry became interested in the improvement of materials-handling methods. It had a study made of the handling methods used by the different companies which made up the industry. As was expected, some very good methods were discovered, some very poor methods, and some which were neither good nor poor. By synthesizing the best methods which were found at each step of the process, it was possible to develop a materials-handling sequence which was better than any which was being used at the time in any plant included in the study. It was further possible to go on and improve on this still further and to develop an ideal method which could be built into new plants which may be designed in the future.

"The study uncovered a number of practical ways in which materials-handling costs could quickly be reduced in the participating companies. But it also brought a realization that handling at the plant was the smallest part of the handling to which their product was subjected. It served to stress the fact that if their product was to be able to compete on a cost basis with other products which could be substituted for theirs, they would have to do something to improve and materials-handling methods which were employed *after* the product left the plant."

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and for Drawing, too!

If it's economy you're after, you can't find a lower-cost cutting fluid than Antisep A.P. Base. Mix it up to 30 to 1 with water and get an all-purpose coolant at around 7 cents a gallon. Use it as a drawing lubricant, too, mixed with either oil or water. Antisep is efficient—gives longer life to tools, fine finish, permits faster speeds. It's the talk of machine shop men everywhere. Have you tried it?

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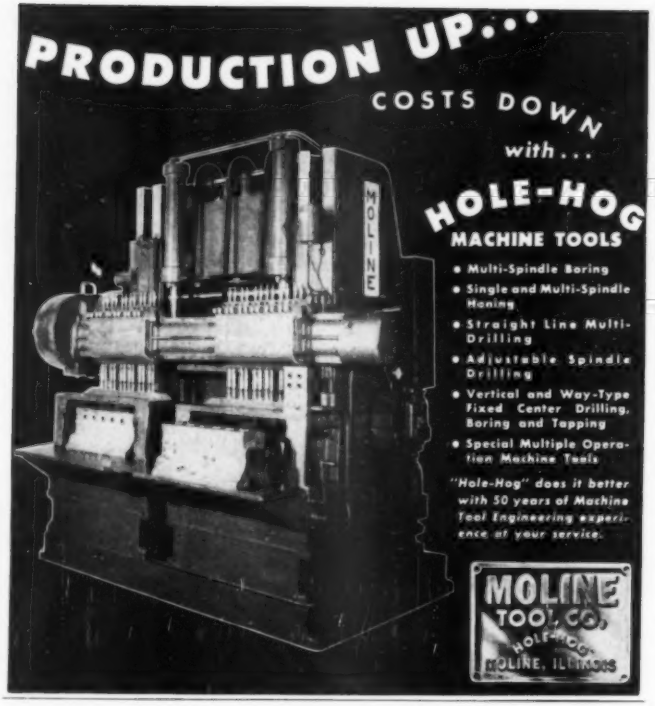

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What Users Want Is Told Handling Industry

MANUFACTURERS of materials-handling equipment have a responsibility to improve their methods of production, their products, and their service to users, according to T. O. English, assistant general purchasing agent, Aluminum Co. of America, in an address before the Materials Handling Conference arranged by the Materials Handling and Management divisions, ASME.

Enlarging upon his first point, English said, "There is a real incentive for reducing production costs and lowering prices. I am sure that you would jump at the opportunity of making such improvements for your customers . . . why not for yourselves?"

Turning to the subject of sales engineering, the speaker stressed that "the need for reliable service is an outstanding challenge to manufacturers of materials-handling equipment.

"Manufacturers of materials-handling equipment are in a unique position. Because of the nature of their product, they are often required to give advice on a wide variety of engineering problems. Consequently, their sales engineers must be better than average.

"This should not imply that materials-handling sales engineers must be the equivalent of consulting engineers who know thoroughly all phases of the engineering profession. But sales engineers must know their own products! They must understand not only the advantages but also the limitations of their products. In other words, they must be good enough to know when *not* to sell. Reliable service is essential to a sales-engineering program. It should be predominant in materials-handling sales policy.

"Service is important to the consumer. In normal times, an estimated 90% of all materials-handling commodities are purchased either on the basis of quality first, service second, and price third, or, service first, quality second, and price third. Service and quality are so nearly equal in importance that it is often impossible to determine which is the deciding factor for the average purchasing agent.

"This emphasis on service can also be applied to design engineering. Manufacturers of materials-handling equipment should encourage their design engineers to investigate customers' problems on the job where first-hand information can be obtained. You are all aware of the value

to the uses for HANSEN COUPLINGS

NEEDED IN EVERY FLUID LINE

Economies are created in every plant by the use of HANSEN couplings in fluid lines. The quick-connective and shut-off features of these couplings save you time and money, and the variety of jobs they do is endless.

HANSEN couplings make connections and change-overs a matter of seconds. Costly operations are not interrupted . . . equipment continues to produce. Connection is made by pushing plug into socket . . . flow starts at once, automatically. Slight movement of the socket sleeve releases plug, and supply line is immediately sealed . . . one-way or two-way shut-off. For applications where no closure is desired, a "straight through" series has been designed.

Each HANSEN coupling is engineered for the service for which it is recommended, and there is no limit to the uses for HANSEN couplings in these services.

Write for Industrial Catalog No. 47

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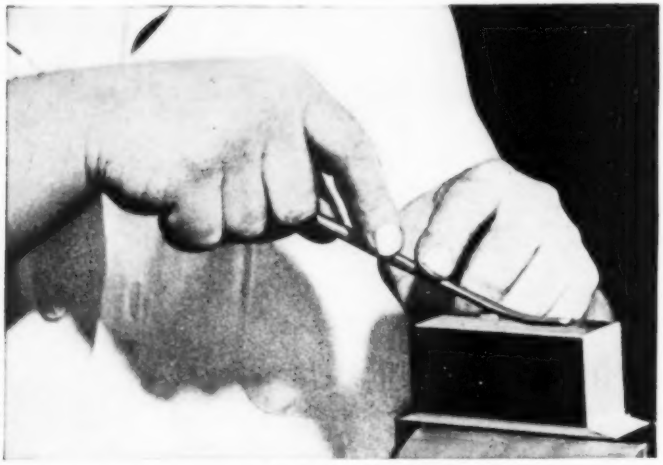

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of exchanging opinions and discussing practical situations as they occur. Design engineers who never make such visits often become highly specialized pencil-pushers behind a screen which separates them from practical situations; they are apt to lose the ability to relate their imagination, ingenuity, and initiative to real problems. Attendance at industrial exhibits and demonstrations also helps the design engineer to keep the emphasis on service. Regardless of the industry, there is no real substitute for current practical experience as a key to sound service engineering.

"The materials-handling industry, in taking full advantage of its opportunities, must revise its approach to this sales and design-engineering problem. Manufacturers that improve their own production methods, emphasize service selling, and maintain an alert, informed staff of design engineers, will move into a leading position in the industry. The potentialities of such a policy should not be overlooked."

•

Handling Unit Aids Planning and Control

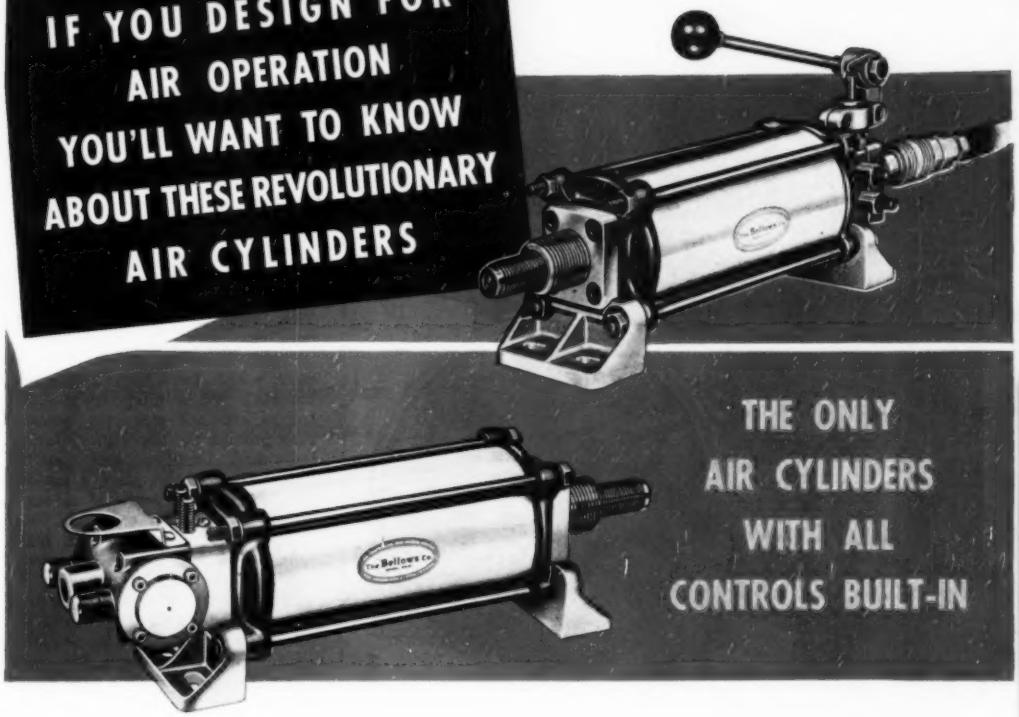
"EVERYWHERE WE TURN we are faced with the need of a common unit of handling against which we can measure the extent of material-handling costs," said W. J. Dernberger, supt., Materials Handling Engineering, Ford Motor Co., at the Materials Handling Conference, arranged by the ASME in Philadelphia.

Stressing the need for integrating materials-handling operations with production operations to achieve lower costs, Mr. Dernberger pointed out that this integration depends upon a known handling volume and capacity. These in turn require a consistent unit of handling volume, which must be, "universal in application," "discernible in the actual handling activity," and adapted "to being costed as a unit of handling work." To develop a proposed unit, the speaker analyzed basic factors in handling. In his words:

"First, what is a handling cycle? It is, pick-up, move, and place. So—how does that fit in with normal and scheduled handling?

1. In receiving we unload, move, and store.
2. In production, we take out of storage, move, and place at the operation.
3. In production, we also reverse the cycle on some items and take from operation, move, and store.

IF YOU DESIGN FOR AIR OPERATION YOU'LL WANT TO KNOW ABOUT THESE REVOLUTIONARY AIR CYLINDERS



HERE are Air Cylinders so different in design that they have become known as the Bellows Air Motors. They are not rotary motors but double-acting, reciprocating, cylinder-type power units. Four-way directional valves and separate speed control valves for advance and retract strokes are built-in. Only one air connection is needed, which can be flexible hose.

Mechanically operated models are equipped with an operating lever which works from any angle in any plane. It may be operated by hand or foot, or may be linked mechanically with any moving element.

Electrically operated models are designed for electrically interlocked equipment.

Bellows Air Motors are available in bores of 1¼", 2½", 3⅛" and 4½", and in any stroke length. They can be mounted in any position.

WRITE FOR FREE BOOKLET

Complete description of Bellows Air Motors, technical data, dimensional tables, case histories, etc. Ask for bulletin BM-20. Address: The Bellows Co., Dept. AM-249, 222 W. Market St., Akron 9, Ohio.

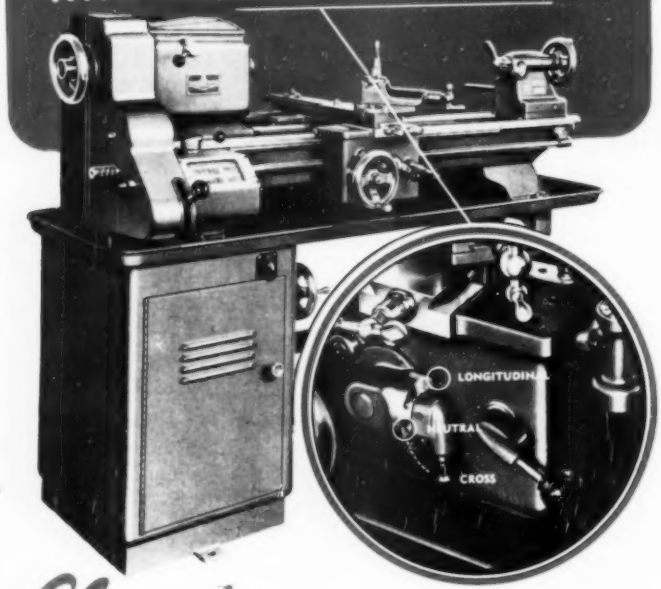
• HYDRAULIC CHECKING OF AIR POWER

The Bellows Hydro-Check removes the natural "bounce" and "springiness" from air — gives the smoothness of hydraulic operation to air-powered equipment — but keeps the speed, flexibility and economy of air-operation. The Hydro-Check is available for use with all Bellows "Controlled-Air-Power" Devices or may be installed to regulate and control the piston movement of standard Air Cylinders.

The Bellows Co.
AKRON, OHIO

MANUFACTURERS OF AIR CYLINDERS, AIR MOTORS, AIR-POWERED FEEDING DEVICES, AIR COLLET CHUCKS, AIR VISES AND AIR HYDRAULIC VISES, AND AIR OPERATED IMPACT AND ARBOR PRESSES

Now GREATER CONVENIENCE WITH INSTANT FEED CONTROL



Clausing

SERIES 200 PRECISION LATHES

Simplicity itself. No clutch to engage, no gears to shift. Just push lever UP for Longitudinal Feed, DOWN for Cross Feed, MIDDLE for neutral.

Clausing Long Taper Key Drive Series 200 Lathes offer more "high price" features than any other lathe in the lower price field.

For smooth, accurate performance, tops in convenience, and more value for your dollar investigate Clausing today. Write for complete details on the New Clausing Series 200 Lathes.

GENERAL SPECIFICATIONS

1" collet capacity
1⅜" bore through spindle
12¾" swing over carriage
7⅝" swing over bed

●

CLAUSING MANUFACTURING CO.
227 RICHMOND AVENUE OTTUMWA, IOWA
Since 1931

MAIL COUPON TODAY

CLAUSING MANUFACTURING CO.
227 Richmond Avenue, Ottumwa, Iowa
Please send complete Literature on Clausing Series 200 Lathes.
Name
Address
City
State

4. In production, we also take from one operation, move, and place at a remote operation.
5. In production, we also take from operation, move, and load at shipping.
6. At shipping, we sometimes take from storage, move, and load. That is all!!!

"They appear to be normal and scheduled handling cycles. These cycles are apparent in original scheduling and plant-layout plans, are universal in manufacturing, discernible in actual material-handling operations. The volume of these cycles could be costed. There are just six basic cycles of handling. That does not seem too complex, does it?

"Now, what else do we have to work with? Let's look at machine handling. We definitely are committed to handling machines, because they provide the opportunity for an individual handling employee to pick up, move and place a ton—or two—or three—or more, at one time. Not only can the individual employee pick up, move, and place more at a time, but he can do it much faster than on foot. So, we will go from there and assume that material-handling volumes and capacities must be based on machine capacities. The modern lift truck offers the most efficient method of lifting, the modern tow-tractor and dolly or trailer train offer the most efficient methods of movement. Just two types of equipment—that is not too complicated, is it?

"In conjunction with the modern lift truck and tow tractor, we have containers. Suppose we had standard containers—three basic units:

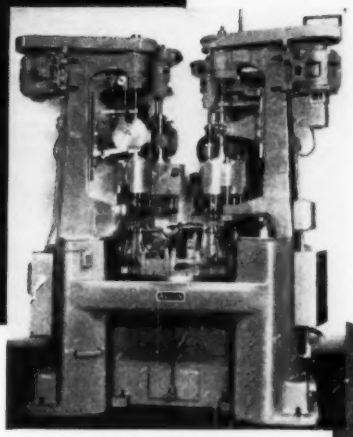
1. A steel tub of approximately 24-cu. ft. capacity
2. A large tub or perhaps a basket-type container of approximately 42-cu. ft. capacity
3. A tubular steel rack of unlimited cubic capacity

"It would almost be self-evident that our unit-of-handling volume and handling work would be the standard container-full. You say, 'Fine, but look at all the materials on pallets, loose, on conveyors, or handled by overhead cranes!' You are right, but remember, we said that a unit-of-handling must be universal. BUT—the fact that some items have progressed beyond the use of this unit, and that some items have not progressed to the use of this unit is not pertinent to the question of economically establishing material-handling volume and capacities.

Leading Drilling Machine Builders

rely Exclusively on

U. S. DRILL HEADS

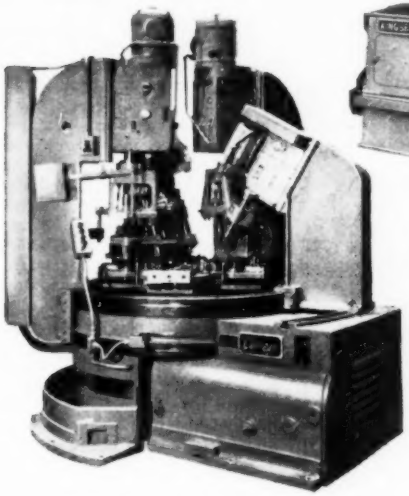


CHAS. G. ALLEN CO.

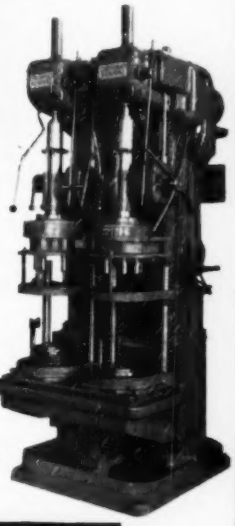
IT'S Performance Data that counts. That's why engineers insist on U. S. Drill Heads.

Write—or wire—today for latest catalog and full information on how we can help you.

KINGSBURY MACHINE TOOL CORP.

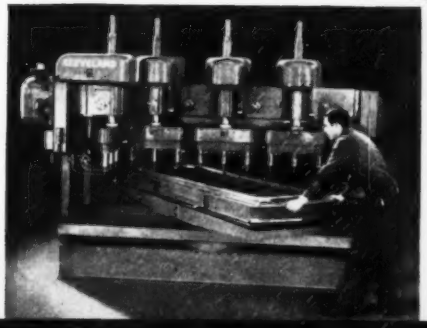


AVEY DRILLING MACHINE CO.



CINCINNATI BICKFORD MACHINE TOOL CO.

WE manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.



CLEVELAND TAPPING MACHINE CO.

US HEADS SINCE 1915

UNITED STATES DRILL HEAD CO.

CINCINNATI 4, OHIO

His Signature--
Your Alloy Protection

This Ryerson alloy inspector's signature completes a triple play for your protection—spark tester to laboratory metallurgist to inspector.

First the spark tester checks the spark pattern to verify the steel's analysis. Then the metallurgist tests it for hardenability in the Ryerson laboratory. Finally, the inspector checks the steel when ready for shipment and certifies with his signature that its type, size, finish, condition, color marking and heat identification exactly meet specifications of the order.

The inspector's signature also means that the Ryerson Alloy Certificate sent with the steel correctly charts hardenability for the particular bars shipped. This Certificate proves that the steel will meet performance requirements — enabling you to buy on the basis of hardenability with complete safety. Heat treating? The Certificate guides you to quick, accurate results.

While we may be temporarily short of some sizes, thousands of tons of Ryerson alloy steels await your call—triple-checked for quality. Just contact your nearby Ryerson plant.

Principal Products

BARS — Carbon and alloy, hot rolled and cold fin., reinforcing
STRUCTURALS — Channels, angles, beams, etc.
TUBING—Seamless and welded, mechanical and boiler tubes
STAINLESS — Allegheny metal plates, sheets, bars, etc.
PLATES—Sheared and U.M., Inland 4-Way Floor Plate
SHEETS—Hot and cold rolled, many types and coatings
MACHINERY & TOOLS—for metal working

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco

RYERSON STEEL

"So now let's get down on the job and see what a material-handling analysis, under the standard container-full unit, would look like:

Receiving 320 S.C.F. Daily
210 S.C.F. Daily
—Into storage
—Direct to operation
—via truck 280 (28 trucks)
—via R.R. car 250 (16 cars)
—to storage "A" 120 (20 trains)
—to storage "B" 40 (7 trains)
—to storage "C" 140 (23 trains)
—to storage "D" 20 (3 trains)
—to production area #1—40 (7 trains)
—to production area #2—60 (10 trains)
—to production area #3—110 (conveyor)

"We will not go on into other sectors of handling at this time. I think it is safe to assume that production and shipping operations can be analyzed accordingly. But, what have we here, now?

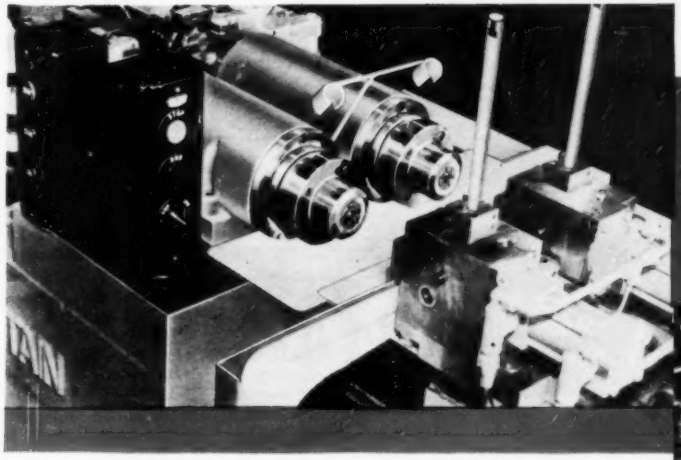
"I think we have an opportunity to tool up our job and to be realistic about material flow at a time when production is tooling up their job. I I think we have an opportunity to assign scheduled plans of manufacture and scheduled plans of material handling, a definite volume and a definite capacity. I think we have an opportunity to measure the performance of the material-handling organization on the basis of a scheduled volume of handling as controlled by three activity factors: receiving, production, and shipping.

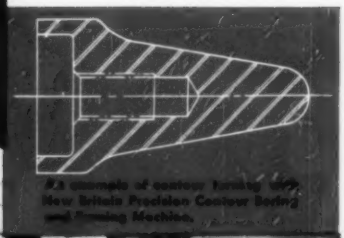
"Each one develops its daily volume of handling, and its related daily volume of work. There is no need to change the detail of standard labor, because the variances and changes in method are measured against standard containers-full through scheduled handling cycles. The detail changes worked out for the lower cost of handling benefit the cost per unit, while those practices, which cause additional handling show up as added costs per unit.

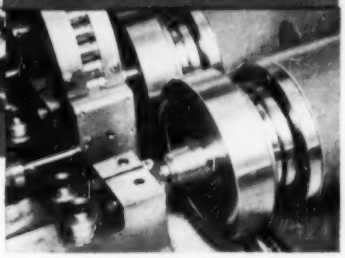
"This system of engineering, operating and costing would place the burden of activity costs on the material handling superintendent. He would be in a position to dominate off-standard and non-scheduled work loads, because he has positive costs to defend his position. On the other hand, those same costs would force him to be continuously bettering the efficiency of equipment, layout and work-arrangements, because his organization is measured, not just his foreman.

"Capital investments, operating

HITTING .000025 ON THE NOSE 7500 TIMES A MINUTE!

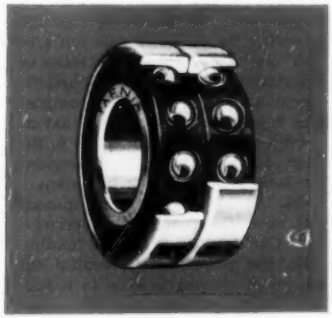






New Britain calls on ball bearings to "hold it"

This new cam actuated Precision Contour Turning and Boring Machine is slashing costs of second operation work by holding tolerances to incredible limits and stepping up spindle speeds as high as 7500 r.p.m. A typical performance . . . .0001 limit on size from end to end on valve guides, .0002 limit on concentricity and .0006 limit from piece to piece. Production rates are jumped from 180 to 300 pieces on one job and to as high as 1800 pieces an hour on another. At such speeds and tolerances, spindles, and particularly spindle bearings, have a real holding job.



Spindle "truth" that's hard to believe

If there's any deviation of this spindle at top speeds, you'd have a hard time finding it. But New Britain's designers modestly claim only a quarter of a tenth at 7500 r.p.m., generously give much of the credit to Fafnir Super-Precision Ball Bearings. At the work end equal length spacers between bearings increase rigidity. The rear pair is "floating".

Name your tolerance and get it with Fafnir Super-Precision Ball Bearings

These super-precision ball bearings, pioneered by Fafnir, are the aristocrats of ball bearings. Instead of the customary precision grade, these bearings are made to the highest industry approved tolerances. Duplexing matched pairs and preloading to precise limits reduce deviation at high speeds, laterally and axially, to practically zero.

An ATTITUDE and an APTITUDE

What Fafnir offers you is more important than any particular ball bearing. It's an attitude and an aptitude . . . a way of looking at ball bearings from where you're sitting . . . an aptitude for doing just what you'd like done about it, gained from solving the bearing problems of not just one or two industries but of all industries. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR

BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

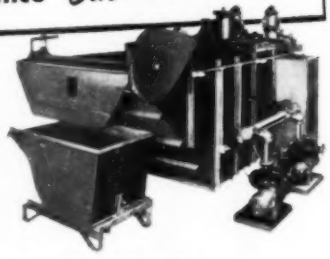
Which GRINDER has HOFFMAN Filtration?

2 hrs. for cleaning
5 to 10 wheel dressings
14 adjustments for size
8 hrs. without stop
1 wheel dressing
1 adjustment for size

Using two identical grinders, a prominent automobile manufacturer never made scheduled production on cast iron valve guides. Then a Hoffman Model 18 Flotation Unit was installed on one of the grinders. It ran without pause through a full eight-hour period. The other grinder required from 20 minutes to an hour to get it to run properly (see panel above.) Now Hoffman flotation equipment enables the car maker to meet higher production schedules easily.

In your case, too, HOFFMAN AUTOMATIC COOLANT CLARIFICATION will *Increase* Productivity *Save* Maintenance *Cut* Unit Cost!

Entirely automatic—no filters to change, no strainers or sumps to clean. Former "down" time becomes new productive time while you save wheels, diamonds and soluble oil replacement costs in the bargain. Total savings more than pay back your investment. For increased, low-cost machining, get the facts in Bulletin A-690 *now.*



Models from 20 to 1,000 g. p. m.
Larger sizes to your specifications

FILTRATION DIVISION
U. S. HOFFMAN MACHINERY CORPORATION
211 LAMSON STREET, SYRACUSE 6, N. Y.
CANADIAN PLANT CANADIAN HOFFMAN MACHINERY CO. LTD. NEWMARKET ONT.

expense and labor—even building, heat, lights and overhead could be costed against this type of handling volume. The fact that an organization is 200% over such basic standards as might be applied, should not be the measure of performance—rather the ability to reduce the 20% to 175%, 150%, etc. When such reductions are not forthcoming, then it is possible to be extremely critical of performance."

NEW BOOKS

GAS CUTTING AND WELDING—*By C. G. Bainbridge M.I. Mech. E., M. Inst. W. Published by Iliffe & Sons Ltd., London. 312 pages. Price 15/.*

Intended chiefly for the practical gas welding operator, but equally useful to the student and instructor, this book covers the entire range of welding and cutting operations.

Starting with a discussion of the various welding gases and their manufacture, sections are devoted to the different types of generators, distribution systems, and general welding equipment. The principles of welding are explained, and the various techniques carefully outlined. Detailed instructions are given for welding and cutting a wide variety of different materials, shop inspection of welded joints, and safety precautions. In addition to numerous illustrations, 55 useful tables are included in the text.

•

MANUAL OF DIE-HEAD THREAD CUTTING. *By H. Schlarman, formerly manager, Thread Tool Div., Detroit office, Jones & Lamson Machine Co. 266 pages. Published by McGraw-Hill Book Company, 330 West 42nd St., New York, N. Y. Price $3.50.*

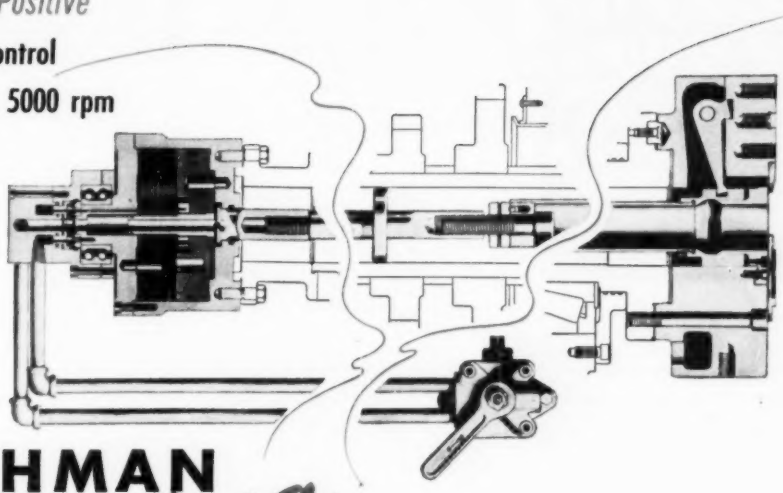
Groundwork for this book was laid when Mr. Schlarman wrote ten articles for publication in AMERICAN MACHINIST in 1946. The enthusiastic reception of these articles prompted him to write a complete manual on a subject of great importance to the shop but seldom fully understood for lack of available information.

As the author says, no manual can take the place of experience, but it is a fact that anyone familiar with the principles governing the design of chasers is able to handle any make of diehead. A given

Faster. . . . Positive

Action *and* Control

at Speeds to 5000 rpm



CUSHMAN *Rotating* AIR CYLINDERS

A FEATURE OF CUSHMAN POWER CHUCKING EQUIPMENT

The high r.p.m. of air cylinders for control of chucks, mandrels and other air operated devices mounted on spindles, posed a problem that Cushman engineers have solved . . . and we now present the new Cushman High Speed Air Cylinders for use with Cushman Power Chucks . . . and with other makes as well.

Precision aluminum alloy construction lowers weight to a minimum . . . gives low flywheel effect . . . long service.

Balanced air pressure on both sides of air seal minimizes leakage . . . means faster action, more positive control, time saving on short run operations.

After assembly the entire cylinder is statically balanced for smooth operation.

For advanced machine tool applications in sizes from 3¼" to 12". Specify Cushman Power Chucking Equipment . . . for new or present machines.

***Write for* BULLETIN**

CUSHMAN also manufactures a complete series of WRENCH OPERATED CHUCKS

Write for Catalog 63 and Bulletins

THE CUSHMAN CHUCK COMPANY

Hartford 2, Connecticut

Consult CUSHMAN

Chucking Engineers Since 1862

2C549

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

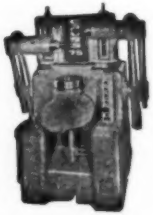
Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.



THE CROSS COMPANY
Established 1898
SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING
DETROIT 7 MICHIGAN

thread trouble is caused by the same conditions, produces the same effect and is corrected by the same measures, regardless of the type of chaser used.

Modern industry has been forced by design considerations and manufacturing economy to pay more attention to the need for accurate threads. But the supply of men who know how to handle threading tools has not kept pace with the demand. Thus, the manual is a noteworthy contribution to the metal-working industry because it will help shop men to identify everyday troubles and apply corrective measures.

•

DESIGN FOR WELDING—*Published by the James F. Lincoln Arc Welding Foundation, Cleveland, 1024 pages. Price $2.00 in U. S., $2.50 elsewhere.*

Composed of abstracts of the 82 award-winning papers in the latest Lincoln "Design for Progress" program, this book covers a wide range of welding applications and provides engineers with a variety of ideas applicable to different structures and products. Comparative cost figures are given in detail in many of the papers which describe the application of welding as a means of reducing manufacturing costs and improving quality and performance.

The book is divided into the following categories: Aircraft, Automotive, Railroad, Watercraft, Containers, Furniture, Structures, Machinery and Welderies, and each section contains papers describing outstanding accomplishments in these fields. Copiously illustrated with photographs, drawings, tables and cost data.

•

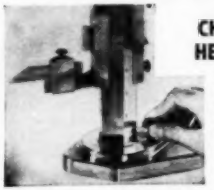
DESIGN OF INDUSTRIAL EXHAUST SYSTEMS—*By John L. Alden. Published by The Industrial Press, 148 Lafayette St., New York. 220 pages. $3.50.*

To keep pace with the rapid development in ventilation during recent years, this second edition of Alden's book has been completely revised and new chapters have been added. Completely practical in approach, but soundly based on engineering theory, the book tells how to design, build or buy an efficient ventilating system.

Subjects covered include exhaust ventilation, low-pressure pneumatic conveying, hoods, piping and structural details, and the selection of dust separators and fans.

SCHERR *aids to precision – production*

Will not shift while measuring—



CHESTERMAN HEIGHT GAGE

A big, sturdy stabilized instrument. Fine adjustment by screw operated from knurled nut on base (see photo) eliminates all chance of rocking or shifting instrument while measuring. Finger pressure on two lugs frees split nut for rapid up or down adjustment of the head. 21½" long vernier in place of the normal 5½" vernier provides greater visibility without the need of magnifier or removing gage from work. Both English and metric readings, one on each face of column. Made in sizes from 12" to 48"—capacities sufficient for the most unusual measurements.

Makes gage blocks doubly useful

GAGE BLOCK UTILITY SET

Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders — 2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg., center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, with no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost. Set $98.50.

Two instruments for measuring cutting and wheel speeds —

Price, $67.50

SCHERR Hand TACHOMETER

Measures rpm without timing or calculation while held against end of rotating shaft. Any variation in speed caused by belt slipping, overload, etc., is instantly noted. Also have disc for measuring surface speeds in feet per min. Made for speeds from 30 to 12,000 changing speed range by new rotating shift mechanism. Other types to 48,000 rpm. Write for details.

SCHERR SPEED INDICATOR

Gives direct readings in rpm in a test requiring only 6 seconds. Needle remains at reading until released by pressure of button. Also measures linear speeds using disc attachment. Two types, ranges to 20,000 rpm. Full data on this and other Scherr speed measuring instruments on request.

Price $37.50

Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N.Y.

Take a good look at a 22% saving

Double Gauge Oxygen Welding and Cutting Regulator, made by John Nageldinger & Son, Inc., New York, "Manufacturers of apparatus for the regulating and control of compressed gases since 1880." The cutaway illustration of the regulator is full-scale. All seals in the body are metal-to-metal, no gaskets being used. All parts, excepting the steel spring and nylon valve seat, are copper and copper alloys made by The American Brass Company.

HIGH GAS PRESSURES and sand castings just don't get along together. In fact, when test stand rejects on this job ran as high as 30% at several thousand pounds pressure, something had to be done about it . . . for not only the castings, but all machining operations were a total loss.

The manufacturer consulted The American Brass Company. Dies were made with a few slight changes in design and Anaconda Die Pressed Forgings, made of extruded rod, were supplied as illustrated here and on the following page.

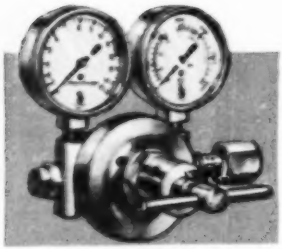
Good news followed quickly: "Leakers" became a thing of the past, for these twice-wrought, dense-grained forgings are gas, air and water-tight. Rejects during machining dropped from an average of 18% to less than 1%. Combined tooling and machining costs were cut in half!

In this instance, the switch to Anaconda Die Pressed Forgings resulted in a net saving of 22%—with rejects and costs *down* . . . dependability and profits *up*.

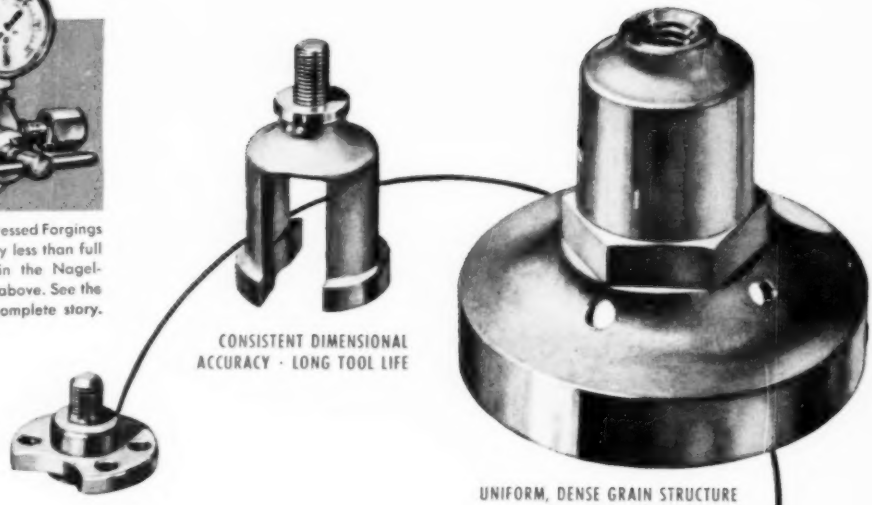
ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY, General Offices: Waterbury 88, Connecticut

Perhaps similar savings could be made on your product . . .



The five Anaconda Die Pressed Forgings illustrated here in slightly less than full scale are being used in the Nageldinger Regulator shown above. See the previous page for the complete story.



CONSISTENT DIMENSIONAL ACCURACY · LONG TOOL LIFE

UNIFORM, DENSE GRAIN STRUCTURE GAS, AIR AND WATER-TIGHT

SMOOTH TEXTURE— LOWER FINISHING COSTS

Don't be misled by their good looks!

Of course they're handsome, but make no mistake—these die pressed forgings are huskies throughout... solid, dense-grained working metal, with twice the strength of ordinary sand castings.

They're easy to machine, too—and more uniform than peas in a pod. Often it's simply a matter of drilling and tapping a few holes, threading a boss, or machining a mating fit—and they're ready for assembly.

If the production of unusual shapes is taking too big a bite out of your profits, send us a drawing, pattern or sample part, together with functional data. There's a very good chance that we'll be able to help you... we've done it hundreds of times for others. For general information on Anaconda Die Pressed Forgings, write for Publication B-9.

48122

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
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ANACONDA

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DIE PRESSED FORGINGS

AVAILABLE IN COPPER, BRASS, BRONZE AND SPECIAL COPPER ALLOYS

Performance Records Prove GREATER PRODUCTION..

WITH LAPOINTE

New Low Pressure Hydraulic System

● The *smoother, cooler and more quiet operation* of the Lapointe—**Double Ram Variable Speed Hydraulic Surface Broaching Machine**—The D R V, has raised production standards on this type of machine thanks to the new low pressure hydraulic system which *eliminates high pressure shock and machine vibration.*

See the new standard double tip-down fixture with its easy loading and high speed operation that makes *continuous* semi-automatic cycling. Several operation stations can be set on each fixture.

Investigate today the new line of Lapointe broaching machines. *Write for folder #162.*

HUDSON LAPOINTE MASS.

THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory • Edgware • Middlesex • England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

OSBORN BRUSHES RELEASE MAINTENANCE CREW FROM "CHAIN GANG"

Continuous cleaning of conveyor chain with brushes simplifies maintenance at General Electric Refrigerator Plant

The new conveyor method of assembly employed at the General Electric Refrigerator Plant, Erie, Pa., is the last word in modern production practices. Here, starting with a compressor unit, a new General Electric Refrigerator literally grows before your eyes as it moves from one operation to another at a speed of 27 feet per minute.

But new ideas create new maintenance problems. At one point in the operation the conveyor chain passes through a rust-proofing solution. This results in a deposit of scale which must be removed from the chain. At first the chain was removed and cleaned in a caustic solution—obviously a costly and time-consuming operation.

Then an Osborn sales engineer was asked for suggestions. The answer and solution is shown above. An Osborn Disc Center Wire Brushing Wheel is mounted on either side of the chain. Revolving with the chain as it emerges from the bath, the brushes remove all dirt and scale. Cleaning is instant and continuous at a mere fraction of former costs.

Time and money-saving ideas such as this are the stock-in-trade of Osborn sales engineers. It's the application that counts and the brushes are only the means to an end. This premium service costs you nothing, may save you much. For complete information write—

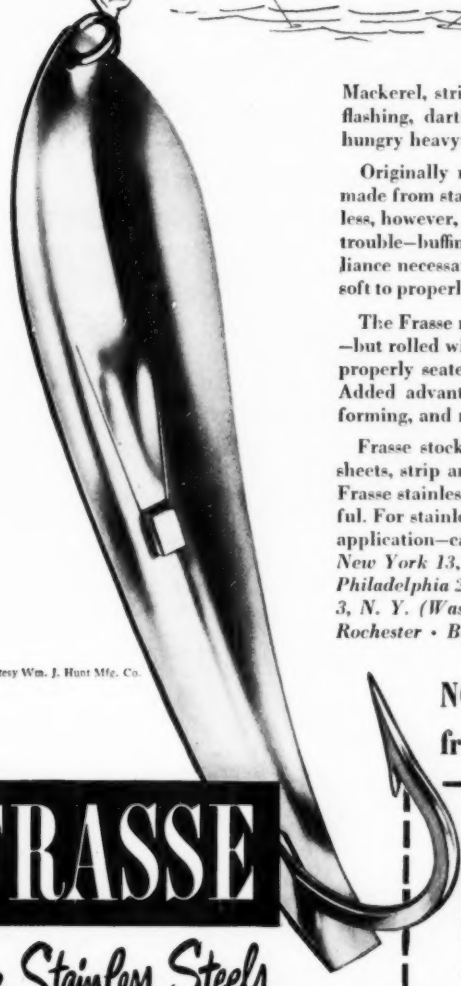
THE OSBORN MANUFACTURING COMPANY

Dept. 100, 5401 Hamilton Avenue *Cleveland 14, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY • POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

STAINLESS "SPOON"
for a Fish's Dinner



Courtesy Wm. J. Hunt Mfg. Co.

Mackerel, stripers, sailfish, even trout go for this stainless Drone—a flashing, darting imitation of live bait, expertly designed to lure hungry heavyweights to a final meal.

Originally made of lacquered nickel-silver, these spoons are now made from stainless steel for lasting brilliance. First trials with stainless, however, were disappointing. The usual commercial grades gave trouble—buffing, even electro-polishing could not bring out the brilliance necessary for an effective lure. Again, these grades proved too soft to properly lock the hook—and hold it in the first lunge of a strike.

The Frasse recommendation was stainless steel of the same analysis—but rolled with a special temper. Result—a more rigid spoon with a properly seated hook, and a more appetizing gleam while trolling. Added advantages included production increases in stamping and forming, and reduced time cycle in polishing bath.

Frasse stocks stainless steel in every commercial form—bars and sheets, strip and tube—even valves, pipe fittings and electrodes. But Frasse stainless *engineering* service is equally handy—and just as useful. For stainless steels, and qualified engineering suggestion in their application—call Frasse. *Peter A. Frasse and Co. Inc., 17 Grand Street, New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Avenue, Philadelphia 29, Pa. (Baldwin 9-9900) • 50 Exchange Street, Buffalo 3, N. Y. (Washington 2000) Jersey City • Syracuse • Hartford • Rochester • Baltimore.*

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This new Frasse stock list supplement shows many new "unusual" items—*big* stainless sheets up to 72" x 144", *square* type 303 bars, *square* stainless tubing. You'll find it a handy source and reference book. Send for your copy today—no obligation.

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17 Grand Street, New York 13, N. Y.

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WAREHOUSE STOCK

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  Many Hundreds of Sizes
  .002" to .065" in thickness — .95 to 1.05 Carbon — 48-51 Rockwell
- **COLD ROLLED ANNEALED SPRING STEEL**
  .003" to .183" in thickness — .70 to .80 Carbon — .90 to 1.05 Carbon

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...THE ANSWER FOR LOW COST, HIGH PRODUCTION PROBLEMS

SAYS "STOP-WATCH PETE" OF BAUSH

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Baush Automatic Hydraulic Transfer Line-ups group several single-purpose units into one multi-operation, fully automatic unit, requiring only one operator — to drill, ream, countersink, bore, spot-face and tap holes in cylinder blocks and heads, manifolds, transmission cases and other component parts required in automobiles.

The Baush Transfer illustrated is only one of many such line-ups comprising one, two or three-way fully automatic machine tools that require a minimum of labor — deliver the highest in production output with the lowest maintenance or down-time costs.

Baush Transfer Line-ups can be designed to meet your particular and specific job requirements — to do that one job faster, better and more economically than it has been done heretofore — and to do all this with far fewer highly paid operators.

Send us your problem today — there is no charge for a survey of your machine tool needs.

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MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

*Fluid Power Improves Production

"LOGAN" AIR-DRAULIC® FEED-CONTROLLED CYLINDERS

- Power Movements in Any Direction
- No Power Unit Required

Combines

the fast-acting, economical, low pressure operation of **AIR**

with the smooth, uniform controlled regulation of **OIL**

Logan Air-Draulic Cylinders provide far more accurate, uniform action than any ordinary air cylinder. They can be furnished for controlled feed with rapid return in either direction, or with controlled feed in both directions. Skip feed movements can also be provided by means of a cam valve in the hydraulic circuit.

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Foot • Center Line • Blind End Flange • Rod End Flange • Clevis

Standard bores from 3" to 8" Any stroke to 5' For air pressures to 150 p.s.i.

***ENGINEERING SERVICE:** Consult our engineers regarding type of cylinders best suited to your needs. No obligation.

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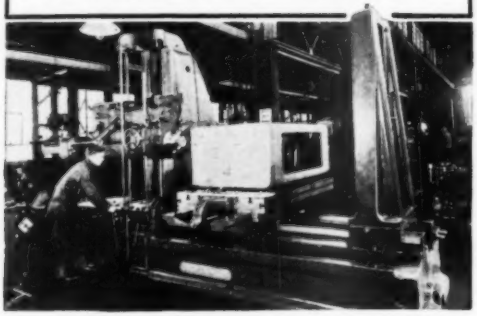

Complete oversize construction of Defiance No. 26 Horizontal Mill insures outstanding ruggedness and precision ... absorbs vibration! Defiance builds the only horizontal boring mill having outboard bearings an integral part of the machine, thus eliminating worry as to accuracy of supports. Experienced shop men find Defiance Mills *built right* with practical features and dependability to "keep 'em producing" and minimize expensive downtime. Write for bulletin. Defiance Machine Works, Inc., 2325 Madison Ave., Toledo 2, Ohio.

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DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

COMTORPLUG Precision Internal Gage

Machine operators increase percentage of acceptable work

This indicating gage shows actual measurement of holes to fractions of .0001", yet is practical for machine operators (as well as Inspectors) because of self-positioning for true 2-point gaging, and fool-proof ruggedness. Detects tapers and out-of-round. No wires, no air hose. Operators control machines better, produce higher average standard of work. Request new Bulletin 10.

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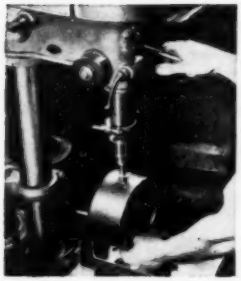
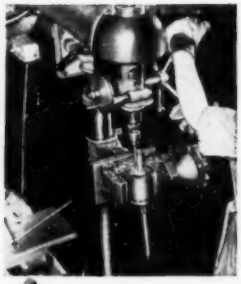
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

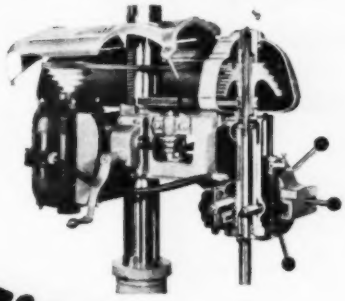
THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.





Model D-1101X. Price:
less motor and column $245.25*



FOR EXAMPLE

KINGSTON-CONLEY ELECTRIC CO.

TRIPLES PRODUCTION BY TURNING MOTOR SHAFTS

WITH WALKER-TURNER 20" POWER FEED DRILL HEADS

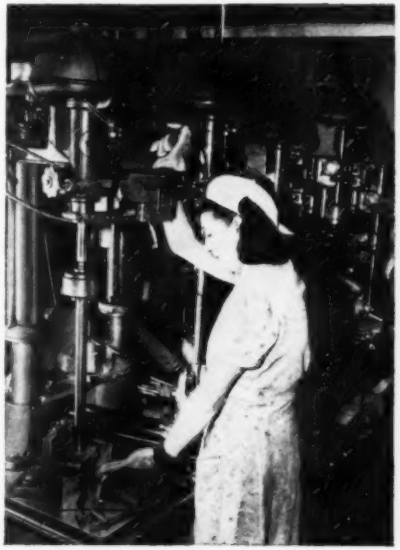
Demands for increased production on turning motor and grinder shafts at Kingston-Conley Electric Co., North Plainfield, N. J., necessitated replanning production equipment and methods.

Replacing five lathes with five Walker-Turner 20" Power Feed Drill Presses each equipped with a molybdenum high speed box tool containing three separate bits held with set screws and a Jacobs Chuck on each spindle, *three shaft diameters are now turned in a single operation.* Power feed controls on Drill Heads feed the work into box tools at .003" to .009" per spindle revolution. Accuracy is kept at .004" tolerance.

Results: **production tripled; man-hour costs halved.**

Taking further advantage of the broad adaptability of Walker-Turner Machine Tools, Kingston-Conley has set up 15" and 20" Drill Heads with similar ingenuity in other departments of the plant. Increases in production and job efficiency have been equally outstanding.

Variable speeds and methods of mounting and control, plus the ability to work metals, plastics or wood, are the marks of all low-cost Walker-Turner Machine Tools. *For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, New Jersey.*



Photo, right: Turning motor shafts on standard 20" Power Feed Drill Presses.
Photo, upper left: Spinning insulation fibre bushings over steel motor bands with 15" Drill Press.
Photo, center above: Balancing motor rotors with 15" Drill Press. Depth Gauge Indicator shows amount of metal to be removed for correct dynamic balance.
Photo, upper right: 20" Power Feed Drill Head, Model D-1101X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. Slo-speed motor optional.

walker-turner **MACHINE TOOLS**

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

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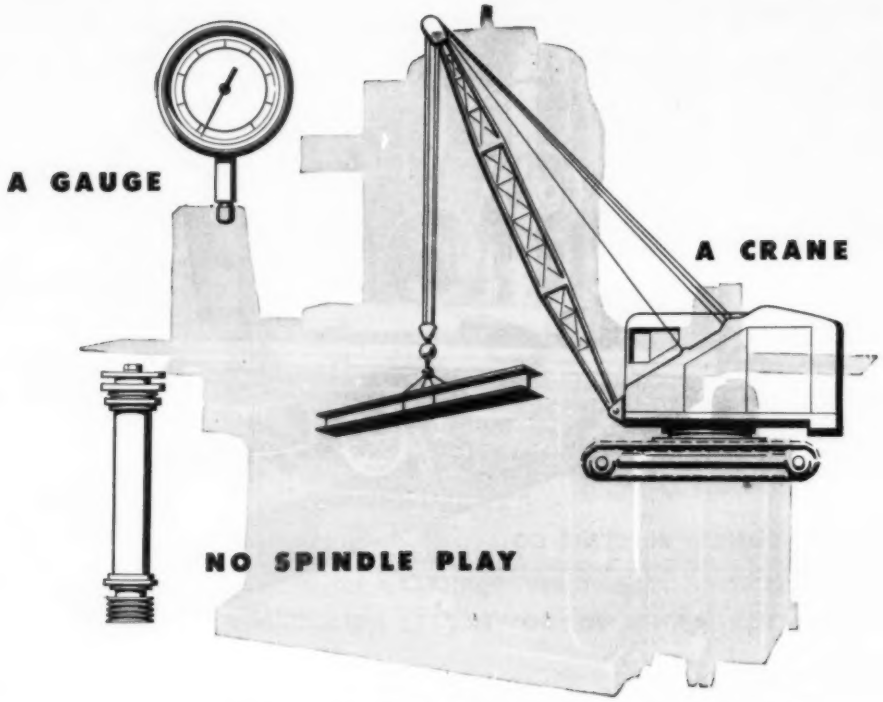


AND GRAND RAPIDS' MICRO-ACCURACY*

A precision gauge can be only as accurate as the grinding machine used to finish-grind it. The sub-assemblies of a giant crane present an entirely different grinding problem. Whether in removing a few ten thousandths of metal in a high-accuracy operation, or in removing a lot of metal with greater allowable tolerances, freedom from spindle play is extremely important. That's just one of the reasons why you find Grand Rapids Grinders in so many leading plants of all types — from manufacturers of precision gauges to makers of huge cranes. Other assurances of long-life accuracy and speed are: the fastest longitudinal table speed (125 f.p.m.) available in any grinder; vibrationless rigidity achieved by massive one-piece column and base casting; patented vertical head adjustment; Bijur one-shot lubricating system.

*Accuracy within 0.00025 limits.

TO SERVE YOU — *Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Tap Grinders, Drill Grinders, and Combination Tap and Drill Grinders.*

GALLMEYER & LIVINGSTON COMPANY

330 Straight Ave., S.W., Grand Rapids 4, Michigan

GRAND RAPIDS GRINDERS

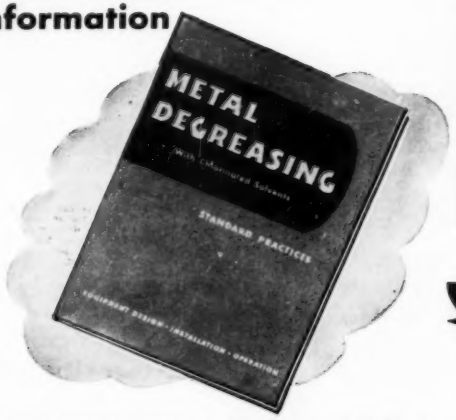
Vapor Degreasing thoroughly removes grease and oil

IN ONE OPERATION, often in less than one minute, this economical cleaning method removes all traces of grease and oil from metal parts of any size or shape—plastics, glass and many other materials. It can save time and cut costs in large and small plants because it speeds production and cleaning.

reaches almost inaccessible places . . . reduces risk of damage

VAPOR DEGREASING reaches deep draws, holes and almost inaccessible places. It reduces the risk of damage to small, delicate parts . . . makes possible more accurate inspections during machining operations or assembly. And it renders parts clean, warm and dry—ready for the next operating step.

This book gives full information



"METAL DEGREASING—STANDARD PRACTICES" tells you how to carry out Vapor Degreasing safely and economically. It shows why the results obtained with this method can't be matched. It shows typical compact, scientific equipment, which is available for efficient and economical operation. And it gives information about solvents used in this equipment—Du Pont Trichlorethylene and Perchlorethylene—which under various trade marks have been widely used for many years. Send for it today!

DU PONT non-flammable SOLVENTS for VAPOR DEGREASING

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. . . THROUGH CHEMISTRY

CLIP THIS COUPON—MAIL TODAY!

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Please send me my copy of "Metal Degreasing—Standard Practices."

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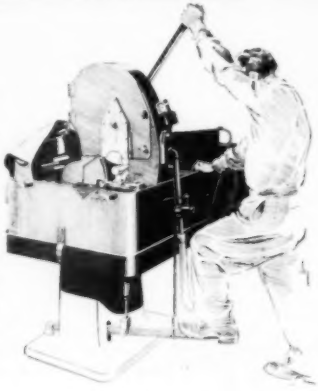
IF YOUR PLANT DOES ABRASIVE CUTTING
CHANCES ARE YOU HELPED TO WRITE THIS ADVERTISEMENT

That's right! For chances are you checked our statements that abrasive cut-off *teamed with the right wheel* would mean savings right across the board. Let's start with . . .

THE METHOD



You found that *abrasive cutting* was appreciably faster . . . and, in the long run, that meant cost savings! And savings, too, in material for the abrasive method slices through steel, brass, copper, aluminum, etc. to size within thousandths . . . with a finished surface that requires little or no machining. Of course, a great deal depended on . .

THE WHEEL . . . and you found it paid to rely on *specialists!* Yes, Allison, the one company in the field that devotes its entire effort to the single problem of abrasive cutting . . . that has had broad experience in analyzing a wide variety of cutting problems, in making specific recommendations that have been job-proved. If you're already doing abrasive cutting, your experience is probably part of our data file . . . and helped us write this advertisement.

On the other hand, if you're *not* doing abrasive cutting in your plant . . . we suggest you investigate the cost-saving possibilities.

DO YOU CUT

STEEL
BRASS
NICKEL
ALUMINUM
GLASS
PLASTICS
TUBING
TUNGSTEN

IF SO CALL AN *Allison*
ABRASIVE CUTTING EXPERT

Allison ABRASIVE CUTTING WHEELS

FREE ON REQUEST
Here are the complete facts on Abrasive Cutting and Allison Wheels . . . yours for the asking. Send for your copies today.
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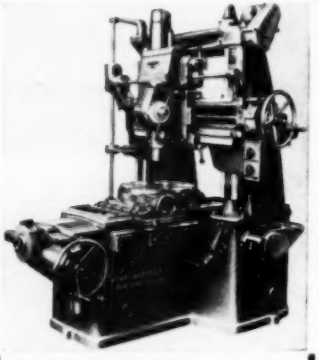
WHY YOU SAVE MONEY 2 WAYS WITH THIS SWISS JIG BORER!

Check These Facts:

1. *You Step-up Production, Reduce Costs and get a Higher Quality Product with Finer Finish* because this borer is a *high-precision Swiss* machine. Its automatic features are capable of fine adjustment with highest possible accuracy. Result: increased production, a perfect finish to the closest limits, and longer life for the tools. But this is only one of the ways you save money!

2. You save money in *first* cost on this Swiss jig borer because you buy direct from this manufacturer. Not only is this important Swiss tool priced no higher than corresponding domestic tools, size for size and capacity for capacity, but, because this manufacturer maintains its own sales offices in the United States, many extra charges are eliminated, making it possible for you to obtain this precision Swiss jig borer at astonishingly reasonable cost.



Model 4C illustrated, with 18 spindle speeds from 45 to 2,000 R.P.M., provides the correct range for all jobs up to the maximum drilling capacity of 1¼". Six automatic feeds of the boring spindle from 0.0008" to 0.0080" per revolution operate when rising and descending.

Positive Accuracy—Stabilized measuring screws of special heat treated steel, equipped with corrector bars to compensate for small pitch errors, assure positive accuracy of setting to 0.0002".

HAUSER
MACHINE TOOL CORP.

MANHASSET, N. Y.

Representing Henri Hauser, Ltd.
Bienne, Switzerland

Get illustrated bulletin giving complete details and specifications for this Hauser Jig Borer.

Mail This Coupon Today!

HAUSER MACHINE TOOL CORP., Dept. A.M.
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Kindly send illustrated bulletin giving complete details of Hauser Jig Borer 4C.

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Want to CUT COSTS? See EX-CELL-O

EX-CELL-O Special Machine Combines Operations to Save Handling... Save Man Hours... Save Space

This Ex-Cell-O Special Machine for turning the tapered ellipse on automotive pistons does a complicated machining job while still maintaining a high rate of production and fine finish. Ex-Cell-O used as a basis for this operation a standard Style 61 Precision Cylinder Boring Machine. Production is 180 pieces per hour net. The engineering "know-how" that makes a job like this possible is available to you through Ex-Cell-O. Write Ex-Cell-O in Detroit today!

49-B

EX-CELL-O CORPORATION DETROIT 32

Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

Over 330% more holes! 25 to 50% less power!

. . . test proves *Blake* Flute Grinders make your tap dollars go further.

Two taps, made by a reputable manufacturer, were taken from the same box. One was used just as it was delivered and lasted for 2,800 holes. The second, sharpened on a Blake Flute Grinder, *cut 9,400 holes and used 25% to 50% less power than the unground tap. And the Blake-ground tap cut far more accurate holes from beginning to end of run than the unground tap.* What's more, the same performance could easily be repeated over and over by regrinding the tap.

That test underlines what users *know from experience:* Blake Flute Grinders cut costs because they give your taps longer life, your work greater precision and use far less power. Act today to make these savings in your shop.

EDWARD Blake COMPANY

GET DETAILS TODAY
FILL OUT AND MAIL COUPON

Edward Blake Company
437 Cherry Street JMM
West Newton 65, Mass.

Please send Bulletin 466 on the Blake Flute Grinder plus complete details on the test mentioned above.

Name _____ Date _____

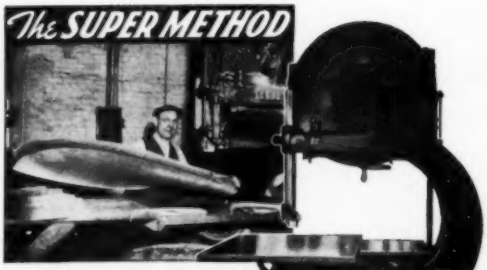
Company _____

Address _____

City _____ State _____

Other Blake Products — for free literature check those you are interested in:

☐ Black Diamond Precision Drill Grinders ☐ Blake Tap Grinders ☐ Blake Flute Grinders ☐ Waltham Cutter Sharpeners ☐ Waltham Thread Millers ☐ American Tool Holders ☐ Surface Finish Standards



of TRIMMING FORMED PARTS
and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

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FRICTION SAWING *with* Tannewitz
HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

THE OLDEST NAME in GRINDING LUBRICANTS

ECONOMY

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THE W&B Co

. . . *Preferred Today*

BECAUSE OF OUTSTANDING PERFORMANCE THROUGHOUT THE YEARS

We can help you do better work, increase production, lower costs on your cutting and grinding operations.
Write for new bulletin 17.

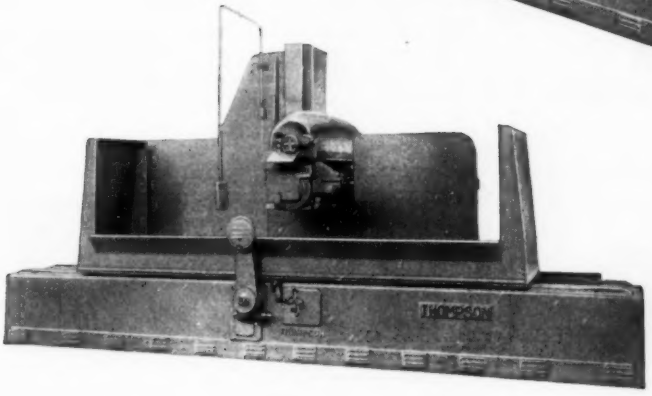
THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.
Grinding and Cutting Lubricants Grinding Oils
Spindle Oils Sulphurized Fatty Bases

BIG THOMPSONS for BIG SAVINGS

in Surface Grinding year after year!

EXAMPLE NO. 1

Above—Thompson Heavy Duty Type CX 30″ x 48″ x 196″ Hydraulic Way Grinding Machine with auxiliary vertical spindle for grinding safety gib, clamp surfaces and rack seats on machine bed. Working capacity of horizontal spindle, 240″. Bed length 46 feet.



EXAMPLE NO. 2

At left—Thompson Heavy Duty Type CX 36″ x 48″ x 120″ Hydraulic Surface Grinder. Equipped with super precision spindle powered with 40 H.P. motor.

The only manufacturer of a *complete* range of heavy duty and light duty surface and contour grinders for industry!

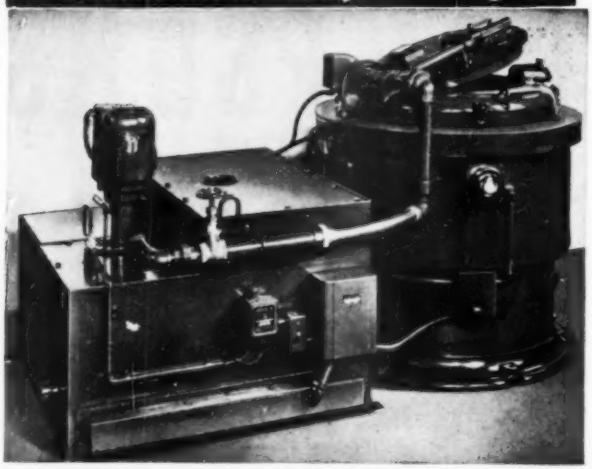
Write for new general catalog

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Copyright 1948—The Thompson Grinder Co.

CONTROLLED IMPREGNATION by the BARRETT "HYDEWA" Centrifugal Process offers many advantages



The Centrifugal Process is limited in application only to the size of the articles that may be rotated in fair balance in the revolving bowl. Coils, condensers, transformers, braiding cotton insulated wire, paper tubes, pressboard spacers, rawhide and bristles, are but a few of the many typical products now being processed in Barrett Impregnators. Many products heretofore considered impractical for satisfactory impregnation by other methods have been successfully handled.

The Barrett Method assures fast production, by reducing the customary hours to minutes, high penetration, with controlled impregnation, also positive expulsion of air from the articles being impregnated.

Basic units are self-contained, direct motor driven. Special arrangements and supplemental equipment also provided.

Submit your problem and samples for test and recommendations.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

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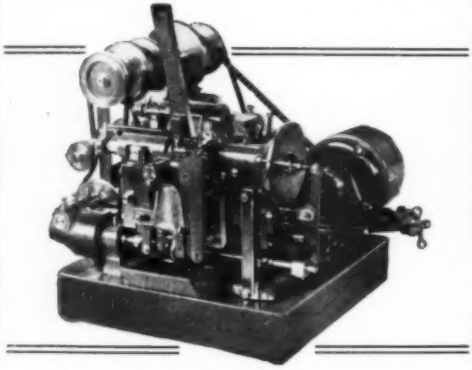
PINION AND GEAR CUTTING MACHINES



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Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

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Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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Patented Cutting Off Tool Holders
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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips. MEANS MAXIMUM CUTTING EFFICIENCY.

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for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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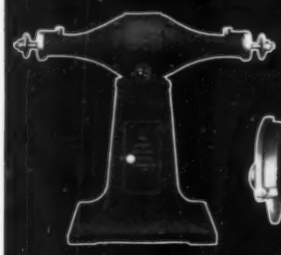
PORTABLE GRINDERS—5", 6", AND 8" WHEEL CAPACITIES



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¼ TO 1 H. P.

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Division of THE R. K. LeBLOND MACHINE TOOL CO.

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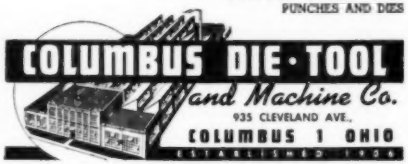
ACCURACY BOOSTS PRODUCTION

the "swing" is to

SPECIAL MACHINERY
AND
the "orders" are going to—
"COLUMBUS DIE-TOOL"

Because we have specialized for years in designing and building single purpose machinery, our "know-how" is unequalled. WE HELP TO KEEP YOU AHEAD OF COMPETITION by designing the right machine for the job. Send us your machinery and tooling problems.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



COLUMBUS DIE-TOOL and Machine Co.
935 CLEVELAND AVE.,
COLUMBUS 1 OHIO
ESTABLISHED 1906

Quick pay-off - - 2 case histories

Automatic drilling and tapping machines pay for themselves in 1 to 3 years by cutting costs of high production parts to pennies.

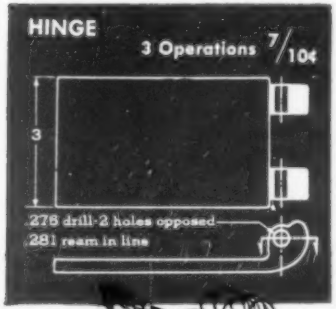
Dear Sir:

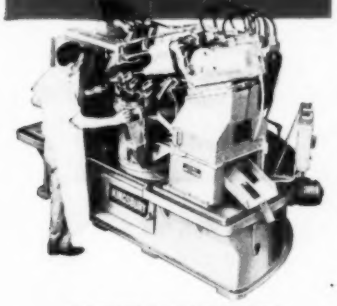
These 2 machines save money. That is the only reason for their existence.

They will pay for themselves in 1 to 3 years. Their owners, like all our customers, are impatient to get their investment back. If a Kingsbury's pay-off period ran over 3 years, they would keep on using their old equipment.

How automatic machines cut costs

Operations are in accurate location. (Bushings guide drills and reamers. One chucking instead of several.)





750 PARTS AN HOUR GROSS

While the man drops 3 hinges into nests, the machine clamps and drills 3 parts, reams 3 parts and ejects 3 parts down the chute. Then he presses a lever and the table indexes.

- 2 units drill from opposite ends at the left station. One unit reaches across the index table to drill from the rear.
- The rear unit reams both pin holes with a 6-inch stroke.
- Air cylinders operate levers to clamp the work automatically.
- All units have 3-spindle auxiliary heads to work on 3 parts at once.
- The machine can operate on similar hinges.
- Bushings guide the drills.
- An interlock prevents the table from indexing until every tool is withdrawn.

Parts are uniform. (Automatic cycles do not vary. Fixtures are identical duplicates.)

Saves floor space. Reduces handling.

But the real big reason is this: More output per man-hour. The operator chucks the work. The machine finishes the job. You can say this about a Kingsbury: Cost is low when production is high.

Sad to say, the opposite is also true. Cost is high when production is low. If you have a tough problem with accuracy or uniformity, a Kingsbury may *still* be a good investment. But if your production runs are short and you do not worry about accuracy, you might just as well turn the page.

Kingsburys do many different jobs

Jobs can be simple or complex — operations few or many, from one direction or several, simultaneous or successive. Holes can be from the smallest up to 1 inch (5 hp).

To find the most efficient setup for each job, we select from a complete line of standard equipment. Just look: 12 automatic drilling and tapping units with 82 standard attachments; 8 standard units and 18 standard bases. There are 4 basic types of indexing machines and 2 types that do not index.

What standard units do

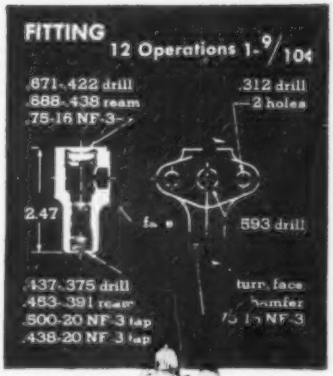
Kingsbury units drill, tap, counterbore, hollow mill, thread, spot face, ream, etc. Attachments mill light cuts in the same chucking with these operations. Multi-spindle auxiliary heads perform similar operations of about the same speed and feed.

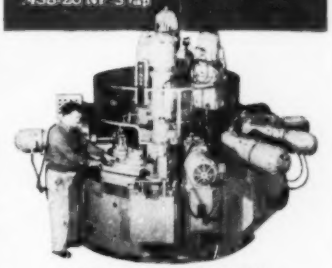
How about sending us a print?

Let's get down to cases. Let us tell you exactly what a Kingsbury can do for you. Send us a print of a high production part and identify the operations and tell us the hourly output you need. If it is complicated, we'd like a sample part too. Our sales manager says it makes the job easier to visualize, but there is more to it than that. He leaves it on his desk; the general manager spies it; a sales engineer joins them. When the argument gets noisy we know they are working out something. You'd be surprised at the ideas they dream up that way. Some of them are darned ingenious.

Sincerely yours,
Kingsbury Machine Tool Corp.
70 Laurel St., Keene, N. H.

P.S. Here is the basis for costs in the case studies. 80% efficiency. Machine paid for after only 6000 hours, a fraction of its expected run. Wage rate above national average. No power or overhead included.





605 PARTS AN HOUR GROSS

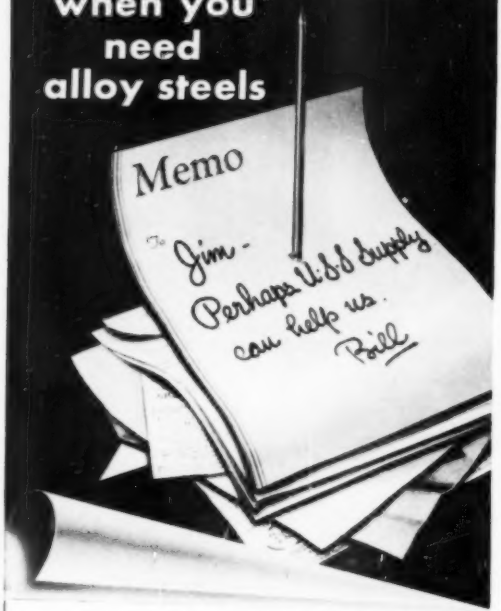
When the table indexes, every chuck rotates 180°. Horizontal units can then work on opposite ends of the fitting. While the man changes parts at the loading station, 4 vertical and 8 horizontal units operate on the parts at 11 working stations.

- A power wrench rotates a screw on each chuck to open and close it quickly.
- 12 self-centering two-jaw chucks are exact duplicates.
- Control is all-electric and meets Automotive Electrical Standards. Control devices are in a separate sheet metal cabinet away from the machine (not shown).
- A plexiglas splash guard hangs from the ceiling. The man lifts it to reach the tools.
- Bushing plates pilot onto locators on the chucks to align the tools.
- The column for the 4 vertical units is in the center so all tools are in easy reach. The working area is not caged in.
- Indexing can be automatic or under the control of the operator. He can jog the table part way for setting up or changing tools.

KINGSBURY

AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

TRY US FIRST
when you need alloy steels



THEN you can rely on getting alloy steels manufactured to a *Guaranteed Minimum Hardenability;* on the prompt filling of your orders; and on additional metallurgical service in the form of a Heat Treatment Guide with each shipment. In this guide, users of U·S·S Carilloy Steels are given specific data on the composition, potential physical properties and recommended heat treatment temperatures to help them obtain the maximum performance from the steel we furnish on their orders.

Contact the U·S·S Supply warehouse or sales office nearest you for all your alloy steel requirements. We welcome your inquiries for literature. There's no obligation.

TURN IN YOUR SCRAP
The more scrap — the more steel

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Makes ALL THREE

These 3 precision machine tools are a necessary part of every completely tooled shop . . . a modern precision lathe with "Zero Precision" tapered roller bearings that will retain its extreme accuracy at new high operating speeds . . . a convenient back-geared shaper that embodies all major improvements . . . a capable small milling machine that will do accurate work . . . all three are extremely moderate in price.

Write for Bulletins

No. 3000A Size "O" Milling Machine

No. T556 11" Lathe 1" Collet capacity

No. 8000 12" Shaper

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Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4234 N. KNOX AVENUE CHICAGO 41, ILLINOIS, U.S.A.

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30 to 1,000 Ton—Built to Order
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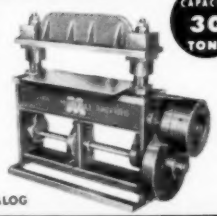
Multi-Max Punch Presses

CAPACITY 30 TONS



EXCEPTIONALLY LARGE BED AND RAM AREAS

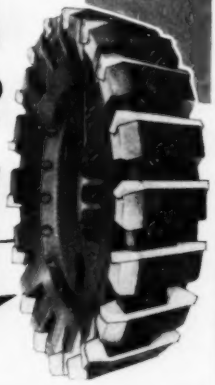
Write FOR COMPLETE CATALOG

DIAMOND MACHINE TOOL COMPANY
3419 EAST OLYMPIC BLVD., LOS ANGELES 23, CALIF.
OFFICE AND WAREHOUSE IN CHICAGO

IF YOU DO PRODUCTION MILLING ON CAST IRON . . .

Are You Willing to Spend $348.00--To Make $3,336.50?

Then Read this Performance Report on the AXIAL FACE KENNAMILL



Long Life and Extremely Low Maintenance Are Cost-Saving Advantages of Solid Blade Axial Face Kennamill

The operation detailed in the table is a production job—where tooling costs are an important factor. It comprises straddle milling the top and bottom surfaces of cast iron cylinder heads.

Use of the Axial Face Kennamill reduced milling costs on this job 80%. And—this saving was made even though the competitive cutter was carbide-tipped, and performed exceptionally well.

The Axial Face Kennamill has extremely abrasion-resistant *solid Kennametal* blades, securely held in position by wedge construction, which prevents thermal strains and permits the high strength of Kennametal to be utilized. These blades can be sharpened at minimum expense in a standard tool and cutter grinder. No steel has to be ground. Only two readily-accessible blade surfaces need sharpening.

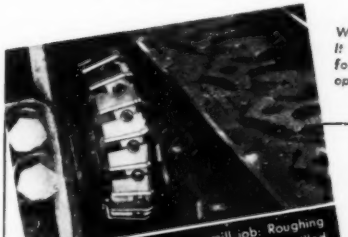
In the typical report shown at the right these facts stand out:
- Solid Kennametal blades last twice as long between regrinds
- More than 10 times as many regrinds can be made per blade
- Only one-half as much time is required to sharpen the cutter

Ask our representative to show you what solid blade Axial Face Kennamills can do on your cast iron milling jobs.

Comparative Results	Competitive Cutter (Carbide Tipped Blades)	Axial Face Kennamill (Solid Kennametal Blades)
No. castings milled per 8 hr. shift	140	140
Number blades per pair of cutters	48	52
Cost per blade	$1.20 (est)	$4.20
Cost, two complete cutters	$312.00	$660.00
Number regrinds per blade	22	250
Number castings milled per grind	140	280
Number hours between grinds	8	16*
Blade cost per 8 hour shift	$2.618	$.437
Blade cost per casting milled	$.01870	$.00312
Time to grind cutter	90 min.	45 min.
Hourly grinding cost (est)	$4.00	$4.00
Grinding cost *per 8 hour shift* or per 140 castings	$6.00	$1.50*
Grinding cost per casting milled	$.0428	$.0107
Total blade and grinding cost Per 8 hour shift	$8.61	$1.937
Per casting milled	$.0615	$.0138
Per year (2 shifts, 5 days, 50 weeks)	$4,305.00	$968.50
**Reground once every other shift*		
Annual savings . . . . . at an increased first cost of		**$3,336.50 $348.00**

KENNAMETAL®
SUPERIOR CEMENTED CARBIDES
KENNAMETAL *Inc.*, LATROBE, PA.

Write for Catalog 48. It describes Kennamills for most face-milling operations.

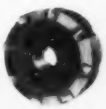


Another Axial Face Kennamill job: Roughing and finishing in one pass—627 pieces milled (18,755 square inches) before cutter required sharpening.

"UNIVERSAL" FACE KENNAMILL
(Solid blades)

"CF" KENNAMILL
(Solid blades)

STEP KENNAMILLS
(Kennametal—tipped blades)



"ODD-JOB" FACE KENNAMILL
(Kennametal—tipped blades)

The

GOSS & De LEEUW

ONE TWO THREE

7 spindle tool rotating automatic chucking machine

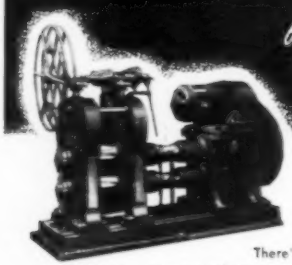
Four Machine Spindles for boring, turning, facing and reaming operations on one to three ends provide greater and quicker production than any other "chucker" in the machine tool industry.

Three Threading Spindles perform from one to three right or left hand single or double threading operations, on one, two or three ends simultaneously, in perfect alignment, at productions from 100 to 500 pieces per hour.

Write for further interesting details.

Goss & DeLeeuw
MACHINE COMPANY
KENSINGTON, CONNECTICUT, U.S.A.

ROLL STRIP, ROD, OR INGOT
ROLL HOT OR COLD STOCK
WITH
"Standard" ROLLING MILLS
by FENN



There's a "Standard" Rolling Mill for every type of service: for breaking down ingots, for precision sizing of thin gauge stock, for forming, grading, cross and pinch rolling, and for various shaping operations. Roll sizes range from 1½" diameter and 1" face to 16½" diameter and 18" face in two, three, and four high Mills. Speeds may be provided up to 1000 ft. per min. Tandem mill stands for synchronized two station rolling also available. Write for Catalog RM.

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1842 BROAD ST., P. O. BOX 235, HARTFORD 1, CONN.

Manufacturers of "Standard" Power Presses to 500 Tons
Swagers • Rolling Mills • Turks Heads
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Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads — Hot and Cold Swaging Machines — Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery

LANGELIER MANUFACTURING COMPANY
PROVIDENCE 7, RHODE ISLAND

FORGINGS and STAMPINGS

DIXISTEEL forgings and stampings are made of carefully analyzed steel produced in our own open hearth furnaces. They are of highest quality and strength.

Send us your prints or specifications for forged or stamped parts, and we will be pleased to submit our estimate for production.

ATLANTIC STEEL COMPANY
P. O. BOX 1714 — DIXISTEEL — ATLANTA 1, GEORGIA

The Foreman of this progressive shop (left) consults with a Gulf Lubrication Engineer on results with Gulf L.S. Cutting Base in machining clock parts.

Costs Down-Production Up!

"We've sharply reduced time per piece, improved surface finish, and greatly extended the number of pieces per tool grind since we switched to Gulf L.S. Cutting Base," says this Foreman of Main Screw Machine Products, Inc., Waterbury, Conn.

"On our new ¾" automatics we are performing two turning, one threading, and one cut off operation on a steel clock part at the rate of 1.2 seconds per piece. With the cutting oil we used previously the time per piece was much higher."

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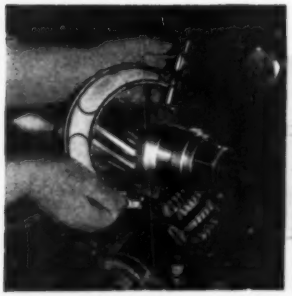

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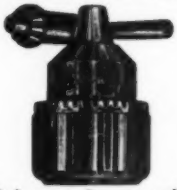

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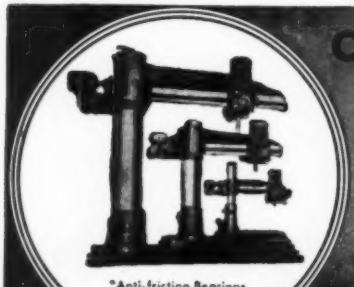

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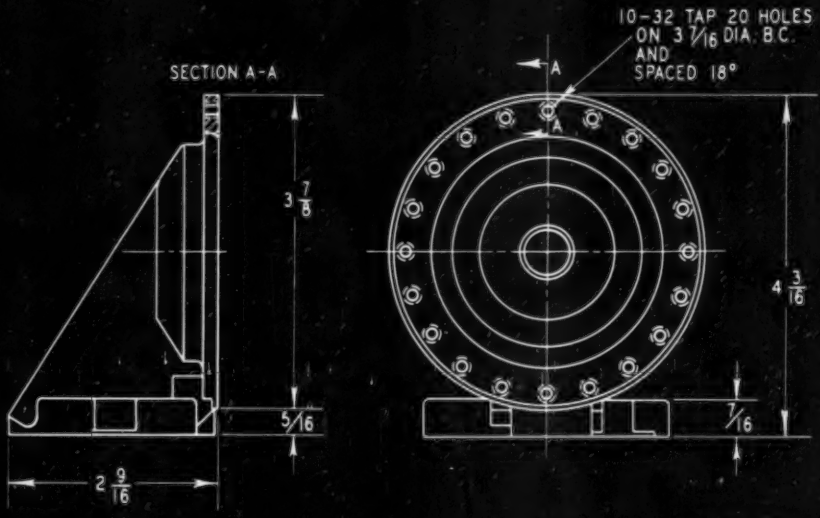
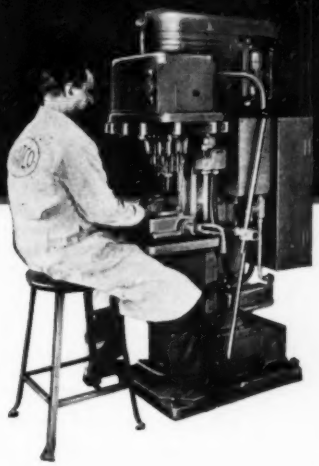


Part—Die Cast Diaphragm Cover
Operations—Tap Ten 10-32 Holes
Index
Tap Ten 10-32 Holes
Production—Approximately 300 Parts Per Hour



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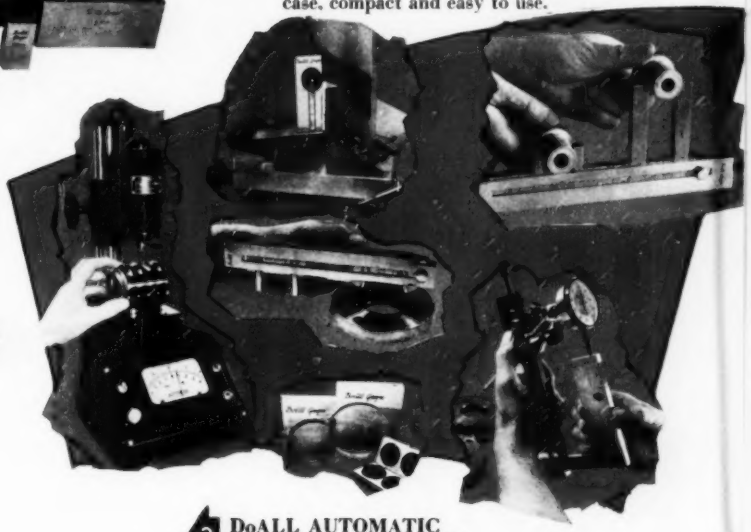

DoALL'S COMPLETE SETS OF ACCESSORIES make your gage blocks into profitable everyday shop tools. These precision instruments and gage blocks are easily assembled to construct snap gages, go-and-no-go gages, height gages, layout scribers, etc. The DoALL Comparator is the world's most versatile; has four separate ranges. **2**

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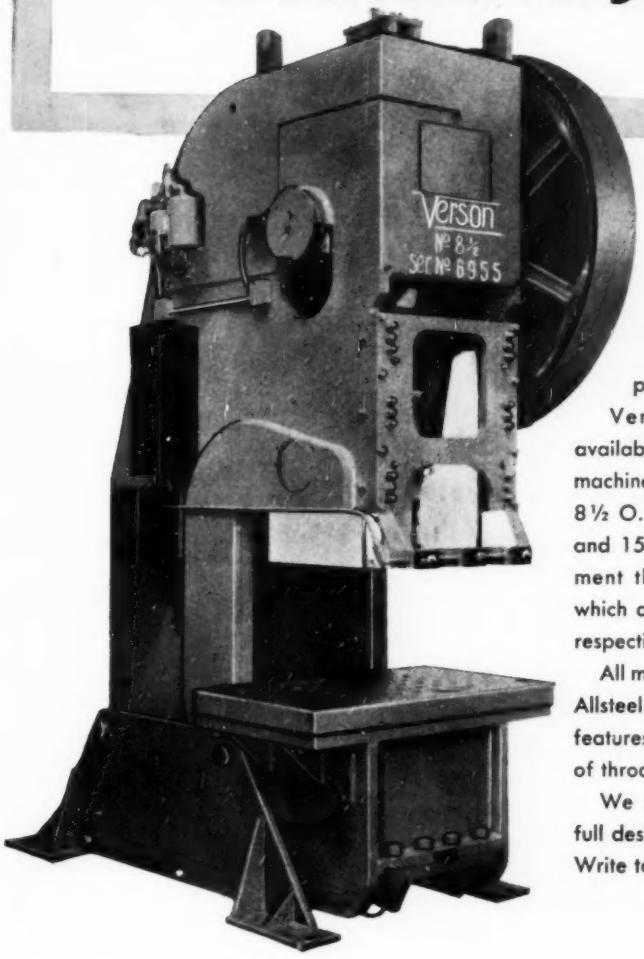

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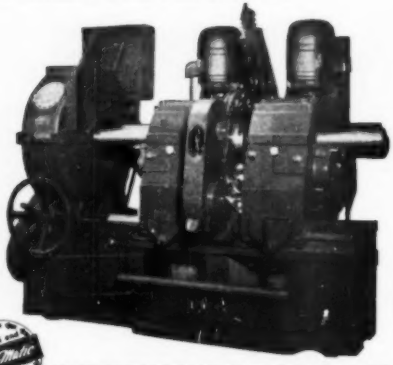

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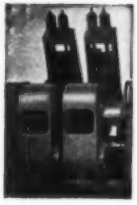

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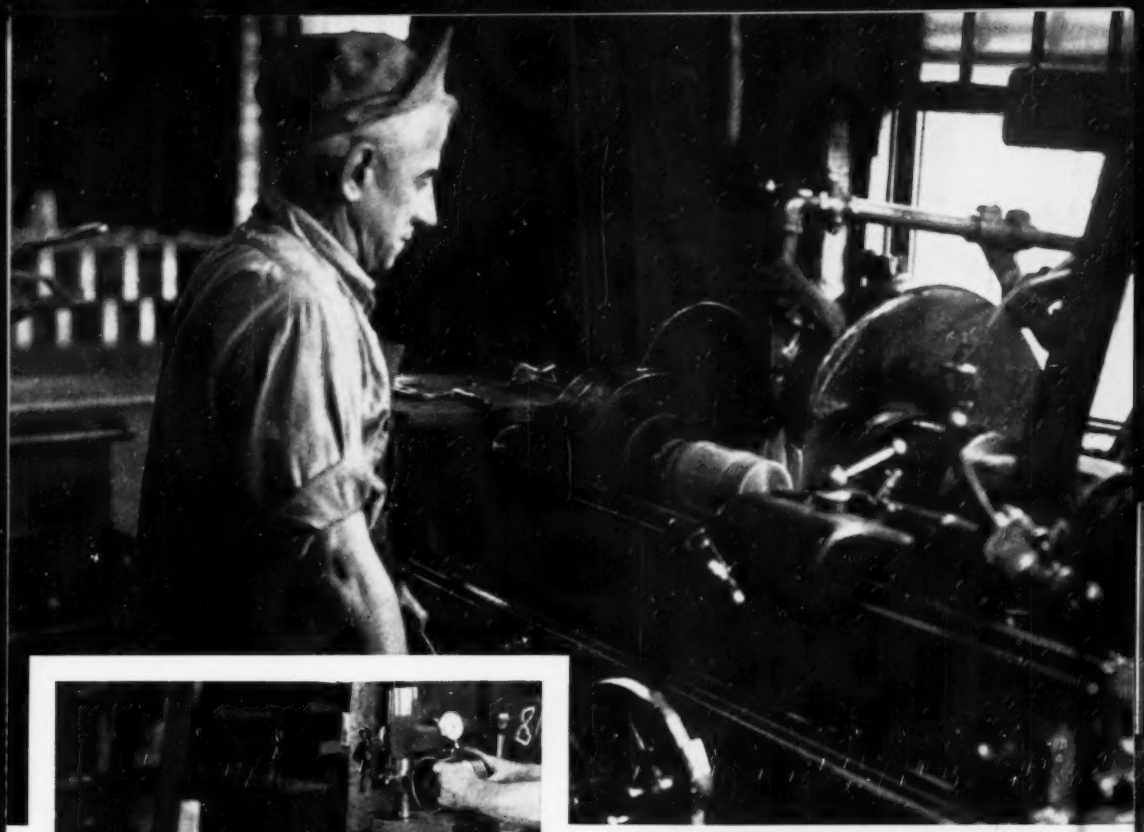

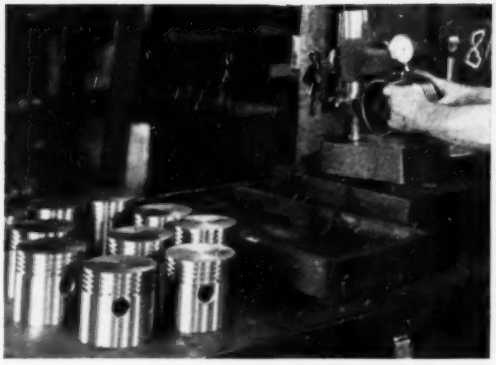

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Gain these benefits for your grinding operations

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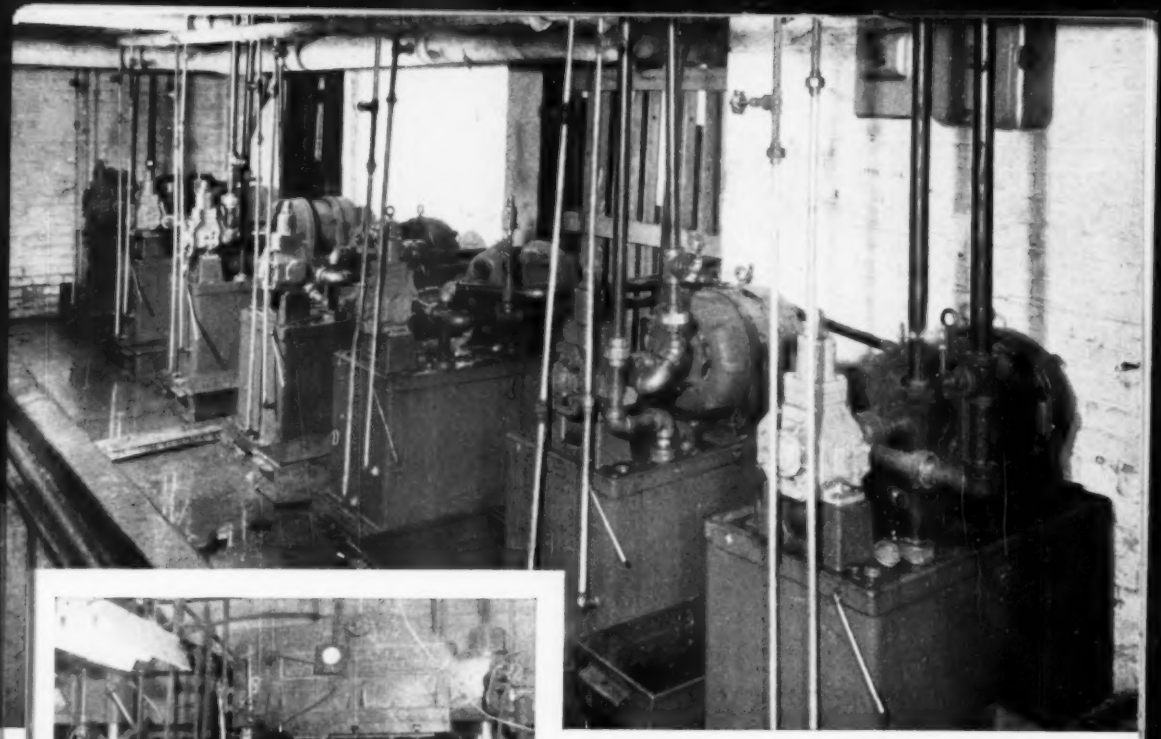
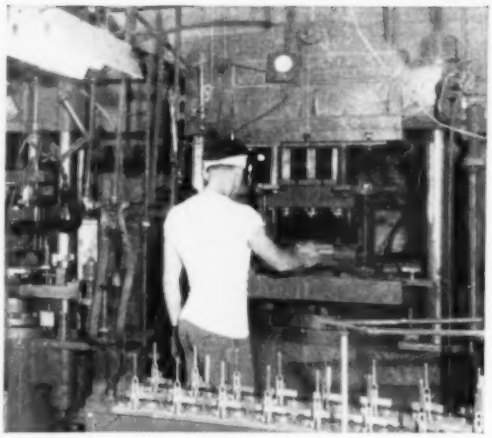
Why not gain these advantages offered by Superla Soluble Oil —advantages that will help you, in turn, to get greater production and economy in your plant. If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

STANDARD OIL COMPANY (INDIANA) STANDARD





Stanoil 95 Industrial Oil

Are your hydraulic operations as free of trouble as this?

THE HYDRAULIC UNITS shown above are used for the operation of plastic-moulding presses in a midwest plant. Hydraulic oil pressures reach 2500 psi. Oil temperatures average between 120° and 130° F. Presses, operating on a three-shift basis, require 24-hour operation of the hydraulic units.

Stanoil 95 has been used as the hydraulic medium in these units for well over a year. During this period of hard, continuous service, the hydraulic oil systems have required no cleaning. No oil changes have been necessary. Hydraulic controls have functioned smoothly.

How does this hydraulic oil performance compare with that in your plant? If you are experiencing trouble with oil deposits, oil deterioration, or oil foaming, you can benefit by changing to Stanoil. This multi-purpose industrial oil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems.

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STANDARD OIL COMPANY (INDIANA) STANDARD

FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 DRILLS—Sibley Machine & Foundry Corp., South Bend, Ind. Two-color Catalog No. 68 lists improved drilling-machine features of Models D-24 and D-28. A direct V-belt drive from motor to transmission, an inching button, and a geared-transmission lever are highlighted.

2 BROACHING MACHINE — Lapointe Machine Tool Co., Hudson, Mass. Six-page folder illustrates DRV double-ram, variable-speed, hydraulic surface-broaching machine, gives specifications and shows typical installations.

3 MILLING MACHINES — Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio. 36-page catalog M-1662 combines up-to-date information on Cincinnati models 2ML and 2MI milling machines. Designs of the machines are the same as before with only routine changes being made in the catalog material.

4 PRESSES—American Gage & Machine Co., Walsh Press & Die Div., Chicago, Ill. 6-page Bulletin 447 describes presses with capacities from 6 to 90 tons and features a new 65-ton press No. 65.

5 STRAPPING MACHINES — Signode Steel Strapping Co., Chicago, Ill. 4-page bulletin illustrates fixed-type and portable strapping machine and features a wire-coil strapper with a ball table which permits free movement of a coil in any direction.

6 LATHES—South Bend Lathe Works, South Bend, Ind. Four-color 64-page catalog 100-G presents complete line of quick-change-gear toolroom and turret lathes. Full color illustrations and lathe specifications are included and a new precision drillpress is described.

7 TAPPER—Thread-All Sales Co., Detroit, Mich. 8-page catalog describes tapping attachment that can be added to any drillpress. Typical installations are described.

8 LATHE—Sidney Machine Tool Co., Sidney, Ohio. 8-page folder features 20 in. model 32 lathe and presents illustrations and specifications. Each component of the machine is described.

9 SURFACE GRINDER—J. B. Crosman & Son, Inc., East Walpole, Mass. 6-page catalog describes the Model "T" surface grinder for odd-job and production grinding.

10 GRINDER — Bowen Grinders, Inc., Beloit, Wis. 4-page data sheet explains basic principles of new flat-surface grinding machine. Schematic drawings are included.

11 FORMING MACHINE — Cyril Bath Co., Cleveland, Ohio. This booklet illustrates many different jobs performed by contract part-forming facilities. Parts are formed from bar, strip, sheets, extrusions or rolled sections.

12 CABINET-FORMING MACHINERY — Cyril Bath Co., Cleveland, Ohio. 12-page catalog depicts cases and cabinets, housings, liners and shrouds formed by tangent benders, power press brakes, multi-benders, contour-forming machine and presses.

13 PRESS UNLOADER—Sahlin Engineering Co., Birmingham, Mich. 4-page folder describes "Iron Hand" press unloader and illustrates a number of applications. Drawings of the unloader are included.

14 RADIAL DRILL—Cincinnati Gilbert Machine Tool Co., Cincinnati, Ohio. 4-page folder gives construction data and specifications for radial drilling machines with 9- and 11-in. columns. A box table and a universal table are described.

TOOLS AND ACCESSORIES

15 TURRETS—Enco Mfg. Co., Chicago, Ill. 16-page catalog lists turret toolposts, self indexing Hexturrets and tailstock turrets with illustrations and complete specifications. Typical applications are also illustrated.

16 DRILLS—Ace Drill Corp., Detroit, Mich. 128-page Catalog No. 48 contains specifications for many types of drills conforming with all changes in drill dimensions made by the American Standards Association. Included are general purpose drills, stub length, taper length, automotive series, and four flute drills. New listings include taper shank drills, three flute, "Hi-Brinell", bonding, and tell-tale drills.

17 HOLE PUNCHING UNITS—Wales-Strippit Corp., North Tonawanda, N. Y. 32-page catalog BL in three colors illustrates setups with hole punching units, T-slotted plate and accessories. Drawings and specifications of standard units are included.

18 FLEXIBLE SHAFTING — Elliott Mfg. Co., Binghamton, N. Y. 16-page Catalog No. 49 illustrates flexible-shaft machines for sanding, grinding, chipping, cleaning, agitating, polishing and drilling. Descriptions of bench and floor stands and attachments are included.

19 TRUCKS—E. Horton & Son Co., Windsor Locks, Conn. 8-page condensed catalog No. C48 presents independent, universal and four-jaw screw combination chucks. Keyless drill chucks, two-jaw lathe chucks and power chucks are illustrated and described.

20 CUT-OFF WHEELS — Allison Co., Bridgeport, Conn. Four bulletins cover abrasive cut-off wheels, rubber-bonded cut-off wheels, rubber-bonded polishing wheels and ball-race grinding wheels. General information and recommendations as well as information for ordering are included.

21 MEASURING MICROSCOPES — The Gaertner Scientific Corp., Chicago, Ill. 24-page bulletin 161-48 describes and illustrates micrometer microscope, traveling microscopes, micrometer slide comparators, instruments for measuring creep and thermal expansion and many different accessories and related equipment. Microscope use and construction are also described.

22 GRINDING WHEELS—Norton Co., Worcester, Mass. 48-page catalog, "Rough Grinding," discusses abrasives and bonds, wheel selection, floorstand and portable grinding and other phases of rough grinding. Wheel shapes and specifications are cataloged.

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23 TAPS—Charles H. Besly & Co., Chicago, Ill. 111-page pocket-sized catalog specifies 28 different taps and lists classifications of fits, tap-drill sizes, cutting speeds and lubricants and screw-thread terms and definitions.

24 SURFACE CONTROL — Physicists Research Co., Ann Arbor, Mich. 8-page bulletin outlines the importance and applications of the latest surface-control methods and defines basic requirements of a system for control of irregularities on machined, ground and finished surfaces. Measurement of roughness and waviness around surfaces of rotation is also covered, together with descriptions of major operating features of available shop instruments.

25 GUN-TYPE SAW — Transa, Inc., Minneapolis, Minn. 4-page folder describes saw which can be attached to a drill, either electric or air powered or to a flexible shaft.

26 COLLAPSING TAPS — Geometric Tool Co., New Haven, Conn. 4-page bulletin S-4 describes new Class S collapsing taps and gives specifications and operating characteristics.

27 STENCILS—Marsh Stencil Machine Co., Belleville, Ill. 36-page Catalog No. 45A describes correct stencil operation, stencilling machine, and illustrates many applications.

28 LUBRICATION EQUIPMENT — Honan-Crane Corp., Lebanon, Ind. 8-page bulletin illustrates equipment for oils and coolant and describes continuous circuit for coolant and cutting oils.

HEAT-TREATING AND WELDING

29 HARD SURFACING—Lincoln Electric Co., Cleveland, Ohio. 16-page Bulletin 466 is a directory for hard surfacing, methods and techniques. Special welding rods and their applications are discussed.

30 ELECTRODE HOLDERS — Tweco Products Co., Wichita, Kan. 12-page bulletin in color illustrates and describes electrode holders and presents specifications for metal- and carbon-electrode holders.

31 OVENS—Young Brothers Co., Detroit, Mich. 8-page Bulletin 8-S presents information on standard laboratory and cabinet ovens and special cabinet ovens for a variety of baking processes. Other literature on heating processes to 1000 deg. F. is available.

32 FLASH WELDER—DoALL Co., Des Plaines, Ill. 2-page four-color circular features pedestal- and table-model welders for tool repairs, extensions or salvage. Special features are described.

33 STUD WELDERS — Nelson Stud Welding Division, Morton Gregory Corp., Lorain, Ohio. 28-page operating manual covers details of stud welding procedure and describes typical applications. Information on maintenance of studwelding gun and timer control unit is included.

34 INDUCTION HEATING — Ohio Crankshaft Co., Cleveland, Ohio. 48-page illustrated brochure by Tocco Division on induction heating includes general principles, case histories of hardening, forging, brazing and annealing problems with all four applications in different sections of the manual.

PLANT SERVICE EQUIPMENT

35 JACK TRUCKS—Skarnes Engineering and Supply, Inc., Minneapolis, Minn. 4-page bulletin illustrates Rol-A-Lifts which are used in pairs for lifting and moving heavy crates. Specifications and photographs are included.

36 CRANES—Conco Engineering Works, Mendota, Ill. 8-page bulletin No. 3000 depicts overhead traveling cranes, jib cranes, I-beam trolleys and chain hoists with illustrations and descriptions.

37 PALLET TRUCKS — Barrett-Cravens Co., Chicago, Ill. 16-page Bulletin P476 shows electric and hand lift trucks, pallets and pallet systems.

38 INDUSTRIAL TRUCKS — Hyster Co., Portland, Ore. 36-page company magazine "Lifts" contains articles and departments relating to materials handling with various types of industrial trucks. A feature describes the electric utilities industry and the importance of equipment handling in its maintenance and growth.

39 HOISTS—Coffing Hoist Co., Danville, Ill. 4-page Bulletin C-200 catalogs ratchet lever hoists, hoist-jacks, electric hoists and gear hoists. Important data on hoists and trolleys are included.

40 LIFT TRUCKS—Buda Co., Harvey, Ill. 4-page Bulletin No. 1440 describes Models F-10 and F-20 with capacities of 1000 and 2000 lb. The bulletin also contains general data on fork lift trucks.

41 CONVEYORS — Sermat Conveyor Co., Chicago, Ill. 6-page folder features steel belt conveyors in horizontal and tilted models. Specifications and drawings are included.

42 TRUCKS — Schwitzer-Cummins, Co., Indianapolis, Ind. Bulletin describes load dispatcher, pallet carrier, fixed platform truck and hydraulic lift platform truck, and includes information and drawings of components.

43 SWITCHES—Micro Switch Division, First Industrial Corp., Freeport, Ill. Bulletin 51 describes Microtrip safety switch for installation on presses. Another bulletin features explosion-proof switches.

44 HYDRAULIC CYLINDER—Geroter May Corp., Baltimore, Md. 18-page catalog 103 illustrates power cylinders, hydraulic valves, hydraulic pump units, and complete hydraulic systems.

45 DRIVES—Allis-Chalmers, Milwaukee, Wis. 8-page bulletin describes motors, drives, controls and coolant pumps supplied for machine tools and installed on lathes, planers, grinders, presses and chucking, milling and boring machines. Photographs of applications and installations are included.

PARTS AND MATERIALS

46 PRINTED TAPE — Topflight Tape Co., Div. of Topflight Tool Co., Inc., York, Pa. 8-page booklet DM1 describes cellophane and acetate tape, which is pressure-sensitive and is printed to specifications for machining parts, instruction stickers and name plates.

47 COPPER INDEX—American Brass Co., New York, N. Y. 28-page booklet B-34 "Copper and Copper Alloy Specifications Index" is a compilation of data on coppers, brasses, bronzes, nickels and special alloys. Standard alloys are listed, as are Army, Navy and aeronautical specifications.

48 BRONZE—Johnson Bronze Co., New Castle, Pa. 64-page catalog lists bronze stocks of sleeve bearings for many manufacturers. Stocks include bushings, bearings, bar bronze and babbitt.

49 DIE PARTS—Metal Carbides Corp., Youngstown, Ohio. 36-page catalog No. 48-WP contains prices and particulars on Talide-tipped centerless grinder blades, sheet metal draw dies, wire and tube dies, bolt dies, drill jig bushings, gages and solid carbide bars, tubes and wear strips.

50 SPROCKETS—Cullman Wheel Co., Chicago, Ill. 80-page catalog No. 48 presents technical data on roller block and silent chain and also chains on sprockets, reducers and punch press drivers. Power transmission equipment is illustrated and tabulated.

51 DIE SETS—E. A. Baumbach Mfg. Co., Chicago, Ill. 112-page Catalog No. 50 is bound and in color. A complete line of die sets is listed in a large hard-backed catalog with a tab index. Die sets are identified by drawings and tabulated specifications. Accessories such as plates, benches, pins, bushings and jigs are included as are complete price lists and discount sheets.

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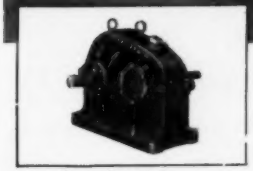
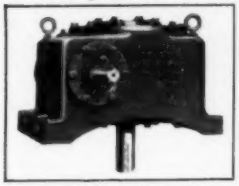
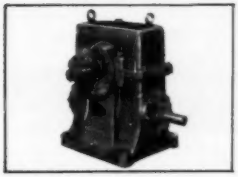


Herringbone Reducer •



Vertical Worm Reducer



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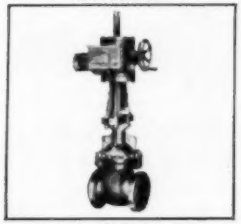

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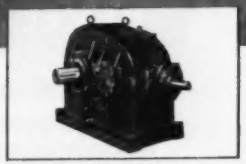
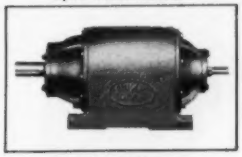
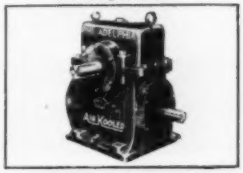


Spiral-Bevel Reducer



Planetary Reducer



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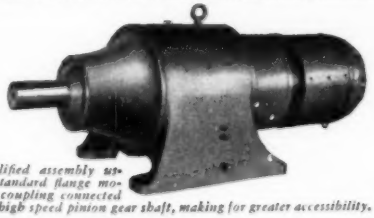

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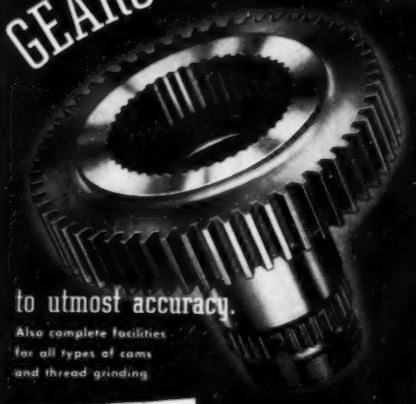

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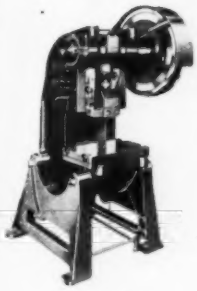

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Perkins Machine & Gear Co.
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P-11A

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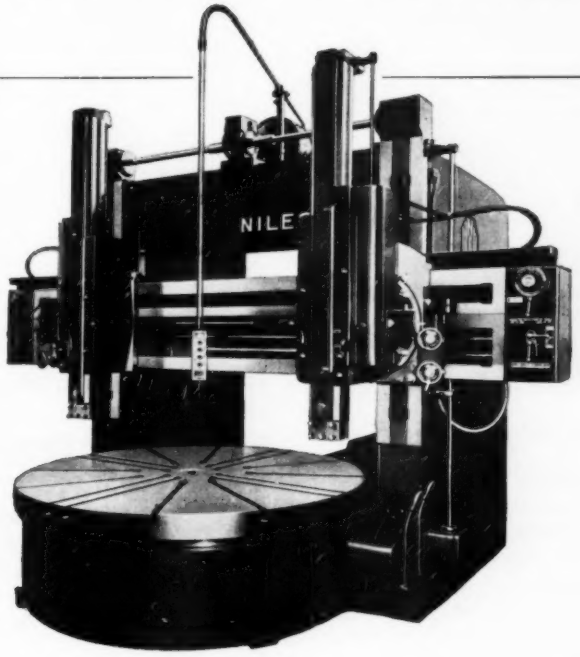

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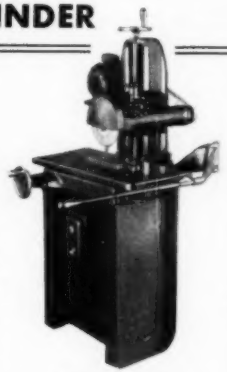

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Tool room accuracy and finish assured on all applications. Either bench or floor mounting available.

Specifications

Capacity: Longitudinal (Work) 8"
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Vertical Distance, table top to bottom of 7" wheel ..... 10"

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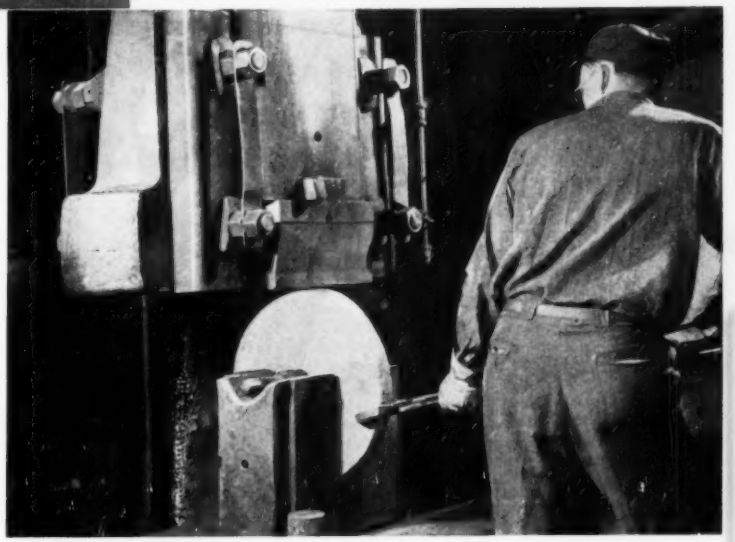

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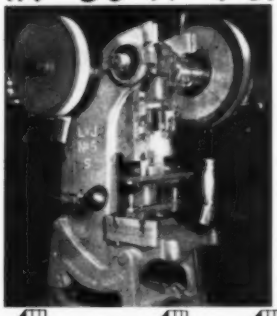

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SOUTH BEND 9" LATHE

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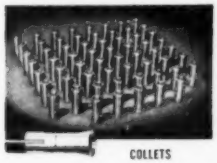
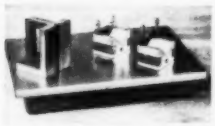


COLLETS



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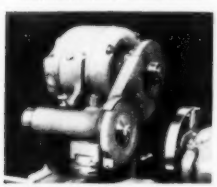
LATHE DOGS

ADJUSTABLE COLLET BUSHING CHUCK

CENTERS AND DRILL PADS

BALL BEARING LIVE CENTER



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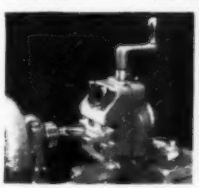
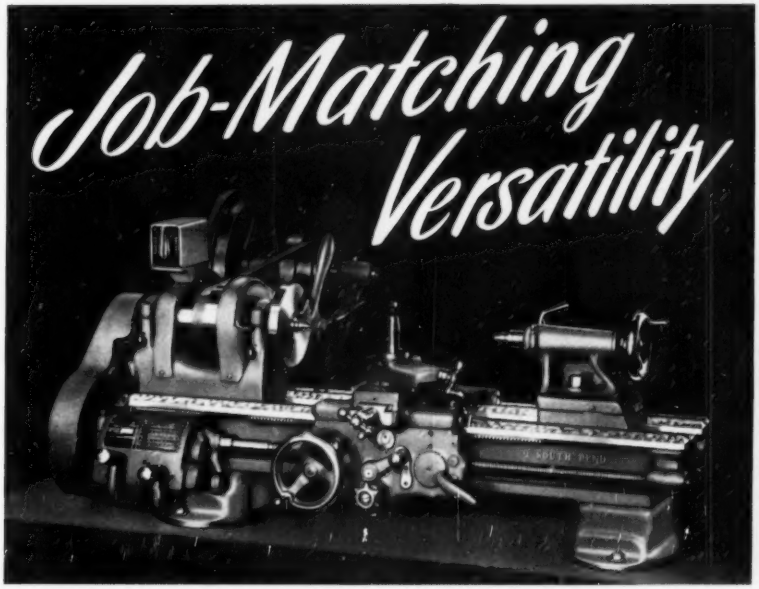


MILLING ATTACHMENT

UNIVERSAL TOOL BLOCK



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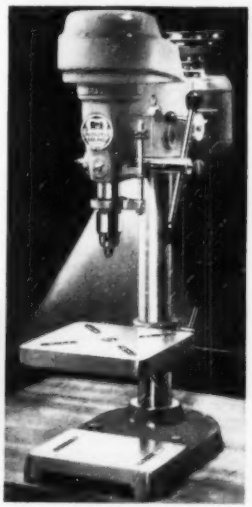

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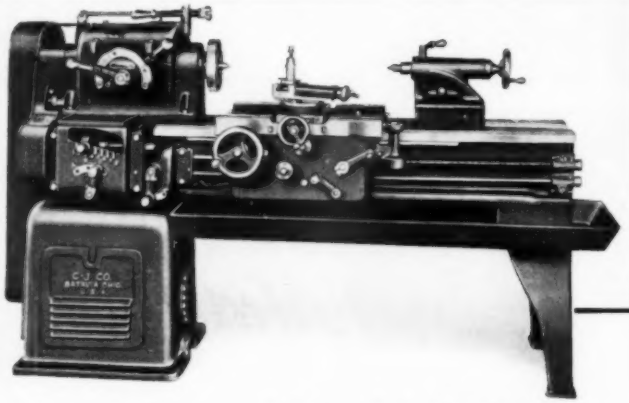

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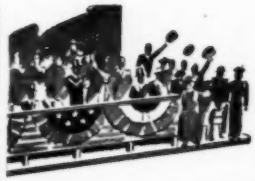

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6	1/4x 1/2	4.36	5.67	6	1/2x 1/2	6.50	8.45	6	3/4x1- 3/16	8.07	10.49
6	1/4x 9/16	4.36	5.67	6	1/2x 9/16	6.50	8.45	6	3/4x1- 1/4	8.07	10.49
6	1/4x 5/8	4.36	5.67	6	1/2x 5/8	6.50	8.45	6	3/4x1- 5/16	8.07	10.49
6	1/4x 11/16	4.36	5.67	6	1/2x 11/16	6.50	8.45	6	3/4x1- 3/8	8.07	10.49
6	1/4x 3/4	4.36	5.67	6	1/2x 3/4	6.50	8.45	6	3/4x1- 7/16	8.07	10.49
6	1/4x 13/16	4.36	5.67	6	1/2x 13/16	6.50	8.45	6	3/4x1- 1/2	8.07	10.49
6	1/4x 7/8	4.36	5.67	6	1/2x 7/8	6.50	8.45	6	3/4x1- 9/16	8.07	10.49
6	1/4x 15/16	4.36	5.67	6	1/2x 15/16	6.50	8.45	6	3/4x1- 5/8	8.07	10.49
6	1/4x1	4.36	5.67	6	1/2x1	6.50	8.45	6	3/4x1-11/16	8.07	10.49
6	1/4x1- 1/16	4.36	5.67	6	1/2x1- 1/16	6.50	8.45	6	3/4x1- 3/4	8.07	10.49
6	1/4x1- 1/8	4.36	5.67	6	1/2x1- 1/8	6.50	8.45	6	3/4x1-13/16	8.07	10.49
6	1/4x1- 3/16	4.36	5.67	6	1/2x1- 3/16	6.50	8.45	9	1/4x2		
6	1/4x1- 1/4	4.36	5.67	6	1/2x1- 1/4	6.50	8.45	9	1/4x2- 1/4		
6	1/4x1- 5/16	4.36	5.67	6	1/2x1- 5/16	6.50	8.45	*MAGNETIC CHUCK PARALLELS (Standard)			
6	1/4x1- 3/8	4.36	5.67	6	1/2x1- 3/8	6.50	8.45				
6	1/4x1- 7/16	4.36	5.67	6	1/2x1- 7/16	6.50	8.45	6	1/4x 1/2	PRICES FURNISHED ON REQUEST	
6	1/4x1- 1/2	4.36	5.67	6	1/2x1- 1/2	6.50	8.45	6	1/4x1-13/16		
6	1/4x1- 9/16	4.36	5.67	6	1/2x1- 9/16	6.50	8.45	6	1/2x1- 1/2		
6	1/4x1- 5/8	4.36	5.67	6	1/2x1- 5/8	6.50	8.45	6	3/4x1- 1/4		
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	1/2" to 1-13/16" High Inclusive by 1/16"	1/2" to 1-1/8" and 1-3/16" to 1-13/16" High Inclusive by 1/16"	1-3/16" to 1-13/16" High Inclusive by 1/16"
STANDARD	$96.00	$71.00	$88.75
PRECISION	124.00	92.00	115.00

All Prices are F.O.B. New York

ANTON MACHINE WORKS
52 Sands St., Brooklyn 1, N.Y. Tel. TRiangle 5-8092

Check An-cor-lox
TRADE MARK REGISTERED

before you pick a lock nut...

If you haven't given An-cor-lox a trial, DO IT, before you pick a nut that has fewer advantages. An-cor-lox nuts are VERSATILE... They can be used where other lock nuts are impractical. For example:

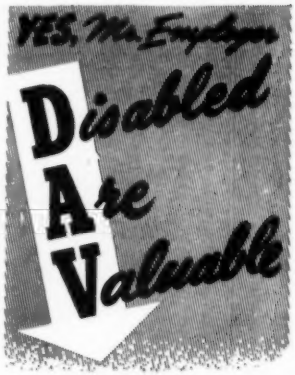
- Locking device on the bottom permits a short stud.
- Cap nuts, thin nuts and spanner nuts are all available.
- Wide choice of materials and finishes for resistance to corrosion, heat and severe atmospheric conditions.
- The locking device fits snugly against the work, forming a pressure seal.

DON'T select your lock nut until you've tested An-cor-lox. Write to us today for descriptive material and free standard samples to fit your application.

An-cor-lox
TRADE MARK REGISTERED
Lock Nuts

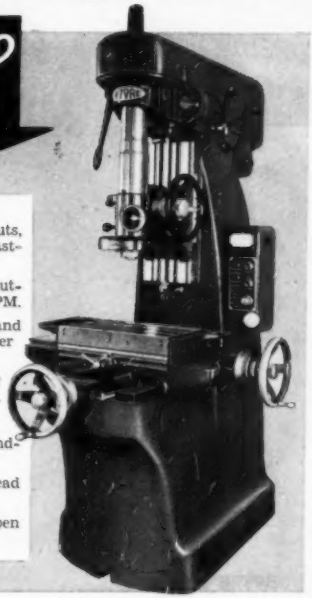
LAMINATED SHIM COMPANY, Inc.
An-cor-lox Division
3102 Union Street Glenbrook, Conn.

AN-COR-LOX NUTS • SHIMS • SHIM STOCK • STAMPINGS



Have you seen the new, larger Moore Jig Borer?

WITH ALL THESE ADDED FEATURES



1. Increased capacity and size—heavier cuts, larger holes—up to 5" in mild steel or cast-iron.
2. Infinitely variable spindle speeds, push-button controlled: range from 90 to 2400 RPM.
3. Three power feed ratios, .0015", .003", and .006", per revolution of spindle in either direction.
4. Centralized control panel and tachometer for spindle speeds and 1-shot lubrication.
5. Disconnect clutch for easy indicating.
6. Satin chrome finish on all dials and handwheels eliminates glare and rust.
7. Trip mechanism prevents jamming of lead screw nuts through over-travel.
8. Totally enclosed drive mechanism—no open belts or sheaves.

All the time-proven advantages of the Moore Jig Borer's *accurate lead screw principle* of hole location have been engineered into the new Model No. 2 to meet the popular demand for a similar machine of larger capacity, plus the added features above.

Like its smaller companion model, the No. 2 requires no size blocks or end measures, yet assures consistently accurate table settings within .0001". A turn of the micrometer dials guides the work to precise location rapidly. All holes in the workpiece can be spotted, drilled, bored or reamed consecutively, by coordinate location, and with minimum tool changes.

See what this quick-starting system of hole location means to your operators—how it eliminates the time-consuming methods of stop-and-start to change tools at each hole.

SPECIFICATIONS

Table working surface	10" x 19"
Table travel longitudinal	16½"
Table travel crosswise	10½"
Table top to spindle end	min. 3" max. 18"
Vertical adj. quill housing	10"
Spindle quill travel	5"
Spindle center to column ways	10"
Spindle cen. to col. below ways	11½"

Send for descriptive literature

With the Moore Jig Borer and Jig Grinder, coordinate calculations made by engineering department are used throughout in boring and finish-grinding to figures instead of to "fit."

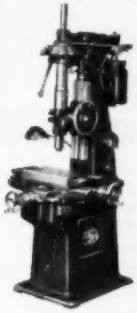
Soft and hardened parts are made concurrently, not progressively. Errors in hardened parts are corrected, not retained and transferred.

Both machines inspect own work without disturbing set-up.

MOORE SPECIAL TOOL CO., Inc.
738 UNION AVENUE, BRIDGEPORT 7, CONN.

WRITE TODAY FOR COMPLETE DESCRIPTIVE LITERATURE ON THESE MACHINES

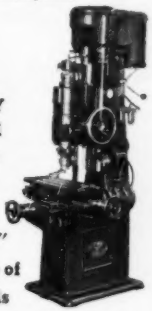
Available Immediately! to promote interchangeability in your toolroom



MOORE NO. 1 Model Jig Borer remains in the line...

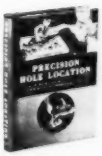
For its range—table working surface of 10" x 16" and cuts up to 3½"—this machine with 1,000 satisfied users is still an ideal buy and will be continued to be offered for the many situations where a small, accurate jig borer fills the required prescription.

MOORE Jig Grinder mechanically relocates and finish-grinds holes in hardened parts to .0001" in ⅓ the time of other methods



The Moore Jig Grinder eliminates hours of checking on the bench and surface plate to correct holes in hardened parts. No toolmaker's buttons or locating plugs are necessary, for this unique machine through the use of *built-in* lead screws *mechanically* relocates and finish-grinds straight or tapered holes in ½ to ¼ the time required by conventional methods.

Have you bought your copy of "Precision Hole Location"?



Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3 in U.S.A.; $3.50 outside U.S.A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

Add a MOORE to YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS · COMPLETE LINE OF HOLE LOCATION ACCESSORIES

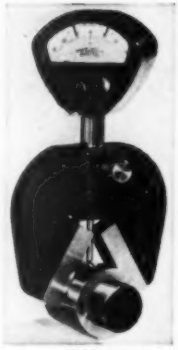
RIDERMIKROKATOR
...for OUTSIDE MEASUREMENTS

The Ridermikrokator is intended for checking out-of-roundness and diameters of cylindrical parts. As the measurements are carried out according to the three point principle the instrument can be used to good advantage for checking centerless-ground pieces.

They are provided with hardened, ground and lapped anvils and insulating grips. The measuring surfaces of the anvils can be tipped with cemented carbide. Price on application.

This instrument is supplied with removable measuring points with ranges from 3/16" to 4¾".

Prices and Literature Upon Application



Setting ridermikrokator by means of a master.

SWEDISH GAGE CO. OF AMERICA
8900 ALPINE AVE. DETROIT 4, MICH.

BUY U.S. SECURITY BONDS NOW!

BUZZER *Gas* BURNERS

NO BLOWER OR OTHER POWER NEEDED!

. . . JUST CONNECT TO GAS SUPPLY.

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The Complete "BUZZER" catalog shows Gas Burners, Furnaces, and other equipment. Write for your copy today.

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121 So. Grand Ave. Baldwin, L. I., N. Y.

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Here's a package of AMERICAN MACHINIST Special Reports which will help you check machining practice in your plant against latest developments.

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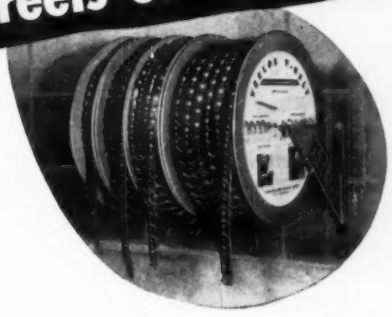
Everyone of these v-belt sizes can be replaced with 4 reels of Veelos



No matter how big your present V-belt inventory, you can drastically cut it with just 4 reels of Veelos. These handy reels give you a choice of more than 316 sizes in O, A, B and C widths. If you use only A and B sizes, just 2 reels of Veelos will provide you with a complete V-belt inventory. Any length belt is quickly uncoupled from a reel, made endless, then installed.

As soon as you specify Veelos on reels, you can stop stocking matched sets of endless belts. You can forget belt deterioration and obsolescence. Veelos on reels saves storage space . . . simplifies inventory records.

Veelos goes on fast . . . lowers machine downtime. On drives with outboard bearings it is installed without moving the motor or dismantling the machine. Veelos is made in all standard sizes . . . fits all standard grooves . . . is available in 100 foot reels. Sales engineers in principal cities; over 300 distributors throughout the country.

VEELOS
THE LINK
V-BELT

New Veelos Catalog... How Veelos on reels makes big V-belt inventories little is just one of the many features in the new Veelos catalog. All the facts and full engineering data are given. Write for your copy today.

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PENNSYLVANIA

VEELOS is known as VEELINK outside of the United States

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

One of a series of messages to help you increase your understanding of business paper advertising, and its effect on your job.

Advertising is your boy!

SOME COMPANIES think nothing of investing hundreds of thousands of dollars in new machinery, in order to trim a few cents off their manufacturing cost per unit. Yet these same companies often waste such savings in costly selling methods – by expecting their *salesmen* to beat the brush for new prospects.

That's not what salesmen are for. Their time is too valuable. And it just isn't good business to send a *man* to do a boy's work. Not when you can use advertising as your "boy" – to do the same job faster, more efficiently, and a whole lot cheaper! For instance –

It costs about $10,000 a year, on the average, to put one good salesman into the field. Assuming that he can make about 750 calls a year, you get an average cost of something over $13 per call. That's not too high if your salesman can concentrate on *actual prospects*. But it's entirely too much to spend on "missionary calls" – especially when you consider that for the same $13 (and usually much less) advertising can make well over a *thousand* such calls on the readers of magazines like this!

Did we say *boy?* Actually, advertising works more like a machine. For by mechanizing part of the selling process, it reduces your cost of *manufacturing a sale*. Just consider the five basic steps required:

1. **Seeking out prospects**
2. **Arousing their interest**
3. **Creating a preference for your product**
4. **Making a specific proposal**
5. **Closing the order**

Advertising performs the first three of these steps. It leaves your salesmen free to concentrate on the last two – which they alone can do, and do best.

Nothing you invest in will go so far toward reducing your cost of manufacturing a sale. And nowhere will this investment yield a higher return than in the business press, where your advertising calls on the greatest possible number of interested prospects, at the lowest possible cost.

American Machinist

is a member of The Associated Business Papers who are sponsoring this campaign. If you'd like reprints of this advertisement (or the entire series) to pass along to others in your organization, we'll be glad to mail them to you, together with a copy of an interesting folder entitled, "How Much Does NO Advertising Cost."

CONTRACT WORK

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

90c per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

Individual Employment wanted advertising ½ the above rate payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $9.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

WANTED—FIRST class practical machine tool designer who has had experience in machine tools, preferably larger sizes. Good opportunity for capable engineer. We are an old established and successful company and build high grade machine tools. Plant is modern; located upper New York. P-7790, American Machinist.

SELLING OPPORTUNITY OFFERED

SALES REPRESENTATIVE wanted for State of Michigan by well-known manufacturer of inserted blade metal cutting tools. Exclusive commission basis. Write SW 8026, American Machinist, giving details of past and present experience, also lines handled at present.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service. 39 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

FOR SALE

INDUSTRIAL CHILLING MACHINE

DEEP FREEZE CASCADE—120° F. Height 38", Length 87", Width 32½". Approximately 7½ cubic feet, WITH 2 MOTORS, ½ and ¾ HP, 3/60/220.
PRICE $1,250.00

WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

PLASTIC DIPPING COMPOUND

7500 lbs. cellulose acetate butyrate hot dipping compound packed in cartons. Suitable for coating tools, dies, etc. for protection against corrosion. Offered ½ usual cost. *Samples on request.*

FS-8004, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

LeBLOND "Big Swing" Lathe

50"x17' centers Heavy Duty Lathe, actual swing 55", 27 spindle speeds, M.D. Taper Attachment, coolant, etc. New 1942—Excellent.

WIGGLESWORTH MACHINERY COMPANY
202 Bent St. Cambridge, Mass.

STOCK MACHINERY

AUTOMATIC—2⅝" N.B. 4 Sp. 1940

BOREMATIC—747-A Heald 3 Hds. 1942

DRILLS—Delta 4 Sp. 17" 1946

MILLS—#3 Cin. Mod. Speed Dial 1942; 45-60 Cin. Hyd. 1933; 35-50 Cin. Duplex Hyd. 1933; #1-12 Cin Automatic 1942; Thread 20 MB Smalley General Taylor Fenn Splino Duplex 4" Late; #3 K & T Vert. Rot. Table Built in.

TAPPERS—#2½ Allen #3 MT 15" Throat #3 D.B. Cleveland 1½" 1944

GRINDERS—Landis 14x72 Ser. 15808; Norton 10x36 Angle 45° Cyl. 1943; Cin. 10x18 Plain Cyl. 1941; Landis 4x12 Mod. 4H 1942; Excello #33 Thread 6x18—1944; Heald 72-A-S Internal 1941; B & S #2 Univ. 1938; Pratt & Whitney 9" Spur Gear ser. 132; Pratt & Whitney 10" Spur & Helical; Ingersoll Cutter 30" ser. 15121

MAGNA FLUX—Model ANQ 484.5 AC 1943

CHIP WRINGER—40" Tollhurst 1945

DUST COLLECTOR—6D, 10D Roteclone

M.G. Set 100KVA 2300 V Syn to 230 V. DC Older.

INDUSTRIAL SERVICE, INC.
Elk at E. 105th St., Cleveland, Ohio

Davenport No. 24SA Rollover.
Osborn No. 42 Core Rollover.
Osborn No. 331 Jolt Squeeze Rollover.
Milwaukee No. 143-9 Jolt Squeeze Strip Machine

D. E. DONY
47 Laureiton Rd., Rochester 9, N. Y.

2—Lodge & Shipley Duomatic lathes
2—Potter & Johnston #5 DE Chucking machines
1—D. E. Whiton #16 gear cutter
1—Monarch Lathe, 22 x 40"
1—3 spindle Gould & Eberhardt spur gear and bevel rougher
1—Heald double spindle Borematic

SIER-BATH GEAR & PUMP CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

1—2A Warner & Swasey turret lathe Model M510. Serial #737913W. Fully equipped for bar and chucking. Electric chuck-bar feed-complete tools.
1—1A Warner & Swasey turret lathe Model M470. Serial #730493. Fully equipped for chucking.
BOTH MACHINES LIKE NEW.

HAROLD B. KETCHEN AND SON
BELCHERTOWN, MASS.

ALL LATE TYPE

BROACH—#3½L LaPointe Horizontal Hydraulic 26 Ton, 64" stroke, New 1941.
GRINDER—#2 Cin. Cntless, Filmatic, New 1942.
GRINDER—10"x36" Cincinnati Plain Hydraulic, Filmatic, New 1940.
MILL—#36 Van Norman Univ. Ram Type, New 1941.
SHEAR—#64 Niagara, 4'x3/16" cap.—New 1942.
TURRET LATHE—#3 Warner & Swasey Universal —800,000 Serial.

ALEXANDER & FIDEN MACHINERY CO., INC.
10 Austin Street Buffalo 7, New York

Landis Type D Plain Grinder 20x48", late model.
#2 Cincinnati Centerless Grinder, old.
Tournacrane Diesel powered, 15 ton cap. with Tournapull. Late Model.
Natco horiz. dbl end drill, machine, late model.
Crown tumbl. barrel, maple wood lined 36x65", new.
Grob saw Model 08-20 late model.
#6 Bliss punch press 125 ton cap., late model.
Lindberg electric furnace 1250°, new.
Demco tapper, 3 spindle, late model.

The Perfection Steel Body Co., Galion, Ohio

The Lowest Possible Die Cost For...

STAMPINGS

IN SMALL LOTS

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Minneapolis 7, Minnesota

F. F. SLOCOMB CORPORATION
Wilmington 99, Delaware

Builders of Special Machines a Specialty. Facilities Available for Production. Quantities of Small and Medium Precision Parts.
Equipment List on Request

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Burk Street Cincinnati, Ohio

WANTED

Belgian factory is looking for the following machines, second-hand and in perfect condition:

GEAR-CUTTING MACHINE for SPUR GEARS AND HELICOIDAL GEARS
a—Maximum diameter 1,200 mm.—modulus 16
b—Maximum diameter 600 mm.—modulus 8

GEAR-CUTTING MACHINE for CONICAL SPUR-GEARS
Maximum diameter 250 mm.—modulus 6

GEAR-CUTTING MACHINE for CONICAL GEARS, "GLEASON" CUT
Maximum diameter 800 mm.—modulus 11

W-7919, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Late type Warner & Swasey Turret Lathe—#3, #4 or #5. Advise serial number, year of mfg., condition, equipment and tooling. Must be priced right.

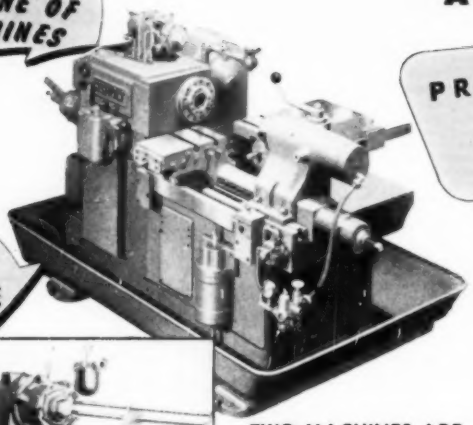
W-7949, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

IF YOU'RE PLANNING OPERATIONS ON ALUMINUM PISTONS . . . . . .

. . . You'll be interested in these four GISHOLT HYDRAULIC AUTOMATIC LATHES

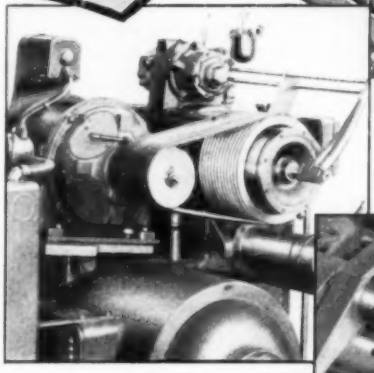
HERE'S ONE OF THE MACHINES

PRICED 'WAY BELOW ORIGINAL COST



Here are four Model 12 Gisholts—built in 1946—in good operating condition—set up as they have been used on aluminum pistons, as follows: for rough and finish turning and grooving; boring and facing the skirt; and centering the closed end.

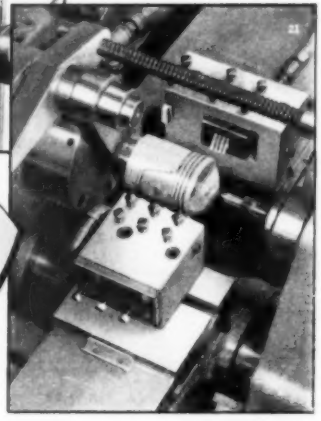
HERE'S THE DRIVE



TWO MACHINES ARE equipped with air-operated tailstocks, front and rear slides, single speed belt drive to spindle, two tool blocks on front slides and one tool block on rear slide.

THE TWO OTHER MACHINES have motor driven centering attachment, facing attachment, front and rear slides, two tool blocks on front slide and one tool block on rear slide. *Motor specifications: 3-phase, 60 cycle, 220-440 volt.*

AND HERE'S HOW THE MACHINES ARE TOOLED



Make the most of this opportunity!

Write or wire for entire specifications and prices. This complete set of 4 machines can be shipped immediately.

If you'd like to keep informed about production machine tools as they become available, send us your name and address and we'll see that you receive such information regularly.

We specialize in production tools of all types.

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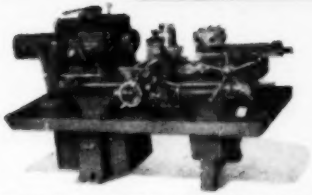
Every Item Guaranteed as Represented



Warner Swasey #3 Universal Geared Head Bar Feed Ram Type Turret Lathe. Late Type. 3/60/220/440 volts motor. FIVE AVAILABLE—some have tooling.

TURRET LATHES

Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw Machine 1½ cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" crp., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity— 3½x3/8x9
Niagara Initial Type. 12'x1/16" capacity.
Webb #2L 5'x10ga. Initial Type Bending Rolls. 5 h.p.

Barnes #307 Single Spindle Hydraulic Twin Cylinder Vertical Honing Machine. Late Type complete with coolant system and 220/440 volts motors and controls. Six speeds, #5 morse taper. TWO AVAILABLE. One has Positive Depth Stop & Dwell Mechanism.

ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boys, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
16"x6' Lodge & Shipley "Patent Head", Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½'x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, collets & Collet Chuck.
14"x8' Rockford, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Edlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
12"x30" American Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey Q.C.G. M. Drive
12"x5' Hendey Motorized. Taper & Collets.
12"x5' Sebastian Q.C.G. Grd. Hd.
12"x5' Mulliner Motorized. Taper Att.
12"x3' Craftsman, Bench, M. Drive
12"x18" Porter-Cable Carbo-Lathe

GRINDING MACHINES

J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 26" Vertical Surface
Thompson Hydraulic Horiz. Surface
Abrasive Automatic Surface 22x8
Reid #2 Automatic Surface, 6x18
Norton Hydraulic Horiz. 6x36
Heald #25 Rotary Surface
New Leach 6x12 Horiz. Surface, 3/60/220 volts
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Gorton Dble. End Disc, 18" dia. discs
Besley Dbl. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff
#2G Brown & Sharpe High Speed Automatic Screw Machine. Serial #6861. Self-contained 5 h.p. 3/60/220/440 volts motor drive & controls. Complete coolant, toolposts, gears, collets. TWO AVAILABLE.
#2 Brown & Sharpe High Speed Automatic.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system.

PUNCH PRESSES

Caldwell 200 tons Horiz. Hydr. Wheel Press.
Niles Bement & Pond Horiz. Hydraulic Wheel Press.
Bliss #18, #20, #20B, #21 O.B.I. Motorized.
Ferracute #86 Wide Frame, motor driven. 61½" between housings. 13⅜" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Rousselle #15 Horn Press. Motor Driven

SHEARS

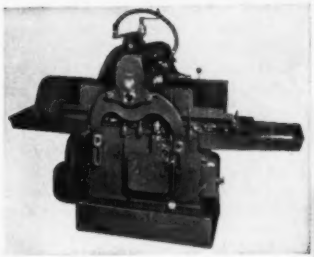
Bliss #109 Slitter, 10 ga. cap. Motorized
Pexto #571 Slitter, 3/16" cap. Motorized
Wais & Roos 10'x¼, 15' gap. Motorized
NEW Famco 36"x18 ga. Squaring
Niagara #152 Squaring Shear. Cap. 52½"x18 ga. Motor driven. Front gauges.

GEAR CUTTERS

Fellows #72 High Speed Gear Shaper, Internal & external, Motor driven
Fellows #7 High Speed Gear Shaper, External, Motor driven
Brown & Sharpe #3—36 Automatic Gear Cutter, 36" dia. Motor driven
Barber-Colman #3 Gear Hobber, 5" dia. 7" face, Motor driven
Whiton #1 Automatic Gear Cutter, 34" dia. 7" face, Motor driven
Adams #1 Gear Hobber, 14" dia. 6" face, Motor driven

MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D. (six)



Cincinnati #2-18 Automatic Horizontal Milling Machine. Late Type, Motor driven with motor and controls. Motor driven coolant system. FOUR AVAILABLE.

Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ame; Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical. Dial Type
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ., Horizontal
Cincinnati #3, #4, #5 Pl. Horz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr. H. Speed
Milwaukee #3K Vertical, M. Dr. H. Speed
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #2B Universal Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Cincinnati #0-8 Auto. Horiz. Same w/rise & fall spindle. FIVE AVAILABLE.
Cincinnati #0-8 Vertical. Motor driven. (EIGHT AVAILABLE)

SHAPERS & PLANERS

Shaper—Columbia 32" B.G. Crank, motorized. Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
NEW—Gemco 20" Universal Shaper. M. Dr.
Shaper—American 24" crank, motorized
Planer—Shaper—Niles-B. Pond 20x20x24
Planer—Betts 72x60x30 Modern 4-Head
Planer—Betts 72x60x25 Modern 4-Head
Planer—Betts 122x72x34 Modern 4-Head

DRILLING MACHINES

Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Fosdick 5" Arm 14" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Cinci-Bickford 3' Arm, 9" Col. Radial. Motor driven. W/table. 12 Speed gearbox.
Walker-Turner 30" Ball-Bearing Radial Drill. ½ h.p. 3/60/220/440 volts motor drive. Tilting Head and Swivel Arm. Universal Machine. Complete with steel bench.
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Cinci-Bickford 21" Drilling & Tapping, #3 m.t.
Buffalo Forge #2MS Drill. Late Type
Barnes 22" Backgeared Upright Single Spdle.
Leland-Gifford #2MS, 2-Spindle Upright
Edlund #2B, 4-Spindle Upright, #2 m.t.
NEW Buffalo Forge #15, #18 Single Spdles.

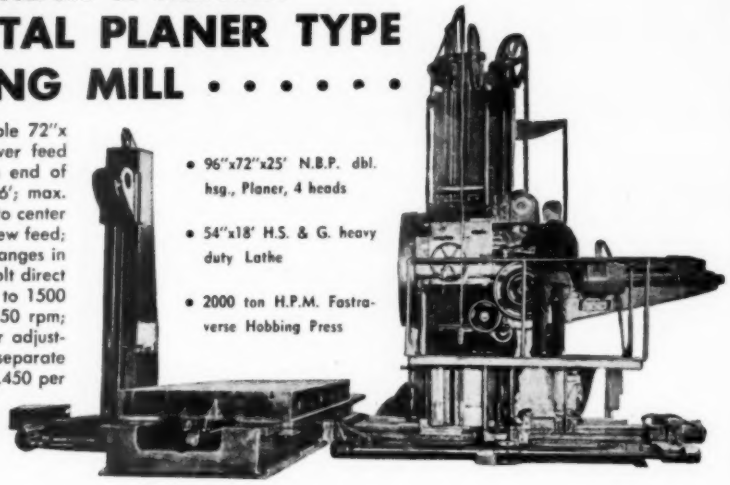
SEARCHLIGHT SECTION

EMERMAN offers from STOCK

7" DETRICK & HARVEY

HORIZONTAL PLANER TYPE BORING MILL . . . . . .

● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; has 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.



- 96"x72"x25' N.B.P. dbl. hsg., Planer, 4 heads
- 54"x18' H.S. & G. heavy duty Lathe
- 2000 ton H.P.M. Fastraverse Hobbing Press

EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

STOCK TOOLS — Prompt Shipment

BORING MILL, Hor. #0 G & L, 3" bar.
BORING MILL, Vert. 14' Niles 2 Hds., M.D.
BORING MILL, 36" Bullard, "New Era"
BORING MILL, 72" N-B-P, 2 hds., M.D.
BRAKE, Press, 36 Ft. x 5/8", 60" thrt., M.D.
CHIP CRUSHER, American, No. SZ-15, M.D.
DRILL, Radial 3' & 5' Cincinnati-Bickford.
GEAR HOBBERS, 12-H Gould & Eberhardt.
GRINDER, Broach, "E" Thompson, 6x48" Hyd.
GRINDER, Disc, No. 24-52" Gardner, vert. spdle.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
GRINDER, Snag., Marschke, wheels 24"x3", M.D.
GRINDER, T & C, No. 3 Ohio
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
HAMMER, St. Forging, 6000# Chambersburg.
LATHE, 14"x6' Hendey, Grd. Head, T.A.
LATHE, 14"x8' L & S, 12-Speed Grd. Hd.
LATHE, 22"x16' L & S, Q.C.G., T.A.
LATHE, 36"x24' N-B-P, Geared Hd., Q.C.G., T.A.
LATHE, 42"x8' c-c, L & S, q.c.g.
LATHE, 24"x12' American, Geared Head
LATHE, 60"-90"x22' American, M.D.
LATHE, Tur., No. 4-A W & S, 8" H.S., M.D.
MILLERS, Pl. No. 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
PLANER, 72"x72"x36' N-B-P, 4 Hds., M.D.
PLANER, O.S., Hyd., 42"x42"x12' Rockford
PRESS, No. 59½, Toledo, 1200 Ton, 14" Stroke
SAW, Friction, No. 1 Ryerson, M.D.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 26" Farquhar
SHEAR, Sc., 18" x ½" Peerless, 18" thrt., M.D.
UPSETTERS, 4" National—2" Acme

LANG MACHINERY COMPANY

28th St. & A.V.R.R. — Pittsburgh, Pa.

GUARANTEED TOOLS

18"x54" LE BLOND Toolroom Lathe, '43
20"x10' AMERICAN High Duty 12 Speed Timken Head, taper attachment, M.D.
24"x16' LODGE & SHIPLEY 12 speed Geared Head Engine Lathe taper attach.
48"x28' DRIGGS (NEW HAVEN) Geared Head Lathe
No. 3 BARDONS & OLIVER Turret Lathe
No. 4 GISHOLT Turret Lathe
No. 4 CINCINNATI Dial Type Plain Mill
No. 1224 KEARNEY & TRECKER Simplex
42"x42"x12' INGERSOLL Adjustable Rail Planer Type Mill, 4 heads, 25 HP motor
32" OHIO Heavy Duty Shaper, 1942
Type BGI-482 KELLER Automatic Toolroom Duplicating Machine, 3 dimensional, 1944
6' CINCINNATI GILBERT Radial, 15" Column, Motor on Arm
6' CARLTON, 17" Column, Motor on Arm
No. 5 NEWARK Universal Gear Hobber 72" capacity.

O'CONNELL MACHINERY CO.
1825 NIAGARA ST. BUFFALO 7, N.Y.

LATHES FOR SALE

BRIDGEFORD 36x24' centers Motor Drive
JONES & LAMSON "Fay" 20x25" Auto. Latest
LODGE & SHIPLEY 25 Duomatic Latest Type
LODGE & SHIPLEY 18x72" centers Motor Drive
LOSWING 8x60" centers Latest Type
NILES 26x48" and 72" centers Motor Drive
NILES 30x50" boring "Time Saver" Latest Type
NILES 30x100" centers Motor Drive
PUTNAM 42x25' centers geared Motor Drive
SCHUMACHER & BOYE 24x156" centers geared MD

CRANES—FOR SALE—*Bargains!*

MILWAUKEE 5 ton, 25' span; 230 volts DC
MILWAUKEE 5 ton, 37'2" span; 230 volts DC
MILWAUKEE 10-ton; 36' span; 230 volts DC
MILWAUKEE 25-ton; 34'4" span; 230 volts DC

HEAVY EQUIPMENT FOR SALE

AJAX 1½", 3½" Upsetter and Forging Motor Drive
BIRDSBORO 325 Ton Vertical Press Hydraulic New 1942
BULLARD 16 6-spindle Multomatic New 1943
CLEARING 50 Ton Hyd. Press New 1940
CRANES from 5 to 30 ton cap. 230 Volts DC
DILL 20-24" Vertical Slotter Motor Drive
LAKE ERIE 500 Ton Vert. Press Hyd. New 1944
LEBLOND #2 Rifling & Reaming Machines
NILES 600 Ton Horiz. wheel press Motor Drive
NILES 5" bar Horizontal Boring floor type, MD
NILES 109" Vert. Boring Mill 2 swivel heads, MD
NIAGARA 1000, 1200 KVA Transformers
QUICKWORK ⅝", 1" cap. rotary shear MD

HARRISON MACHINERY EXCHANGE, INC.
SOUTH 4th ST. — HARRISON, N. J.
Tel.: HUMBOLDT 2-5750; 2-5775

Notice to Advertisers

Because of the Holiday February 22nd, the "Searchlight" pages of the

March 10th Issue of

AMERICAN MACHINIST

Close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME
Display and Undisplayed Ads
Monday, February 21st

"SEARCHLIGHT"

Opportunity Advertising

—to help you get what you want.

—to help you sell what you no longer need.

Take advantage of it—For Every Business Want

"Think SEARCHLIGHT First"

Eastern For • DEPENDABILITY • SERVICE • QUALITY REBUILDING

• LATE MODEL MACHINES • GUARANTEED EQUIPMENT

TURRET LATHES AND SCREW MACHINES

No. 2F Gisholt Fastermatic, m.d., latest type
No. 1H6 Libby, m.d., chucking, latest
No. 1 Cincinnati Acme Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt Universal, m.d., chucking, Timken
No. 1A, 2A, 3A Warner & Swasey Universal, bar and chucking types
No. 2A, 3A W. & S. Universal, chucking, Timken
No. 1A Warner & Swasey Universal, chucking, pre-selector head, latest
No. 2 Cincinnati Acme Full Universal, m.d. chucking, latest
No. 2B Foster Universal, m.d., chucking
No. 2G Morey, bar, m.d., latest
No. 2L Gisholt, m.d., chucking, standard and long bed types, Timken
No. 3 Cinn. Acme Full Universal, m. d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3L Gisholt, m.d., chucking, Timken
No. 3L Gisholt, with cross sliding turret
No. 3 Warner & Swasey Universal, m.d., bar, latest
No. 3 Warner & Swasey Universal, m.d., chucking, latest
No. 3A W. & S. Universal, m.d., chucking, latest
No. 4R Cincinnati Acme, m.d., bar
No. 4 Gisholt Universal, m.d., chucking, Timken
No. 4 Warner & Swasey, Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, bar, m.d.
No. 4 Warner & Swasey Universal, bar, m.d., pre-selector head, latest
No. 4 Warner & Swasey Univ., chucking, as above
No. 4A Warner & Swasey Universal, m.d., chucking, latest type
No. 4A Warner & Swasey Universal, m.d., chucking, Timken
No. 5 Bardons & Oliver Universal Ram Type, m.d., chucking, pre-selector head, latest
No. 5 Foster Universal Geared Head, m.d., chucking
No. 5 W. & S. Universal, m.d., chucking, Timken
No. 7 Bardons & Oliver Univ., m.d., chucking, late
No. 7 Bardons & Oliver, cone
No. 4 FU Fastermatic, m.d.
2½" Jones & Lamson Universal Saddle Type, m.d., bar, latest
2½x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
3¼" Cincinnati Acme Geared Head Flat Turret, chucking and bar types
18" Libby Type A, m.d., chucking
24", 28" Gisholt, cone
26" Libby Type C, m.d., chucking
#5 Woods Tilted Turret Lathe, Model D, cone

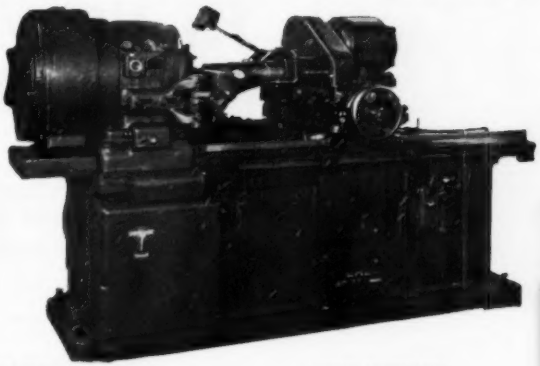
AUTOMATICS

8 spindle 1⅝" Cone, m.d., latest
4 spindle ⅞" Cleveland, Model M, m.d.
4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
No. 5D2—12" Potter & Johnston, m.d., air chucks, 1944 machine
No. 5D2—15" Potter & Johnston, m.d., air chucks, 1944 machine
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest
4 spindle ⅞" Model R-4 Acme-Gridley, m.d.
4 spindle 2¼" Cleveland Model "K", m.d.
2¼" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
4½" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.

HORIZONTAL BORING MILLS

6" bar No. 56 Giddings & Lewis Table Type, m.d., new in 1939
No. 0 Giddings & Lewis, m.d., 3⅛" bar
2½" Cleveland, m.d.
No. 25T Giddings & Lewis, m.d., 2½" bar, latest
No. 31 Lucas, 3" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
No. 45 Giddings & Lewis, m.d., 5" bar
4" bar Detrick & Harvey Floor Type, m.d.
5⅛" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.

▼ 7 NEW No. 73 HEALD AIRPLANE CYLINDER GRINDERS ▲



VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret head, 1 swivel head
48" Colburn H.D., m.d., 1 turret, 1 swivel head
48" Putnam, H.D. m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
84" Niles H.D., m.d., 2 swivel heads, p.r.t.
100" Niles Heavy, m.d., 2 swivel heads, p.r.t.
120" Niles Heavy, m.d., 2 swivel heads

GEAR HOBBING MACHINES

Barber-Colman Model T, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe, m.d.
No. 36H Gould & Eberhardt, m.d., with infeed attachment for worm gears
No. 44 Brown & Sharpe Spur & Spiral, m.d.
48" Cleveland, m.d.

GEAR CUTTERS

No. 3—26" Brown & Sharpe, m.d.
No. 4—48" Brown & Sharpe, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speeder, 10" cap.
Gleason Gear Tester for hypoid gears

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d., older type
Long bar attachment for No. 3 Centerless
Cincinnati Valve Seat Grinder, cap. ⅜" valve stems, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

12x24" Cincinnati Self-Contained, m.d., latest mechanical type
No. 2—12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., late type
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati, arranged for spline grinding
12x48" Cincinnati Hydraulic, m.d., latest type
12x48" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

DISC GRINDERS

No. 4 Gardner Disc, m.d.
No. 20 Gardner Comb. Disc Grind. & Roll Sander, m.d.
7½ H.P. Standard, m.d., new
7½ H.P. U.S. Elec. Tool Co. Disc Grind., m.d., new

INTERNAL GRINDERS

No. 16A—16" Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16RS Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 6, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 24—36 Bryant, m.d., latest
No. 49 Heald Single End Borematic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald Plain, long bed type, m.d., latest
No. 73 Heald Airplane Cy., m.d., brand new, latest
No. 74 Heald, m.d.
No. 172 Heald Gap, m.d., brand new, latest type
No. 174 Heald Gap, m.d., latest
No. 649-16 Van Norman Automatic Oscillating Radius, m.d., latest
Series 5 No. 5 Bryant, m.d., latest

SHEET METAL MACHINERY

No. 3 Hilles & Jones Plate Bending Rolls, m.d.
No. 1 Savage Nibbler, m.d., 34" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
Southwark Rotary Metal Cutter, 36" throat, m.d.
120" No. 100 Niagara Hvy. Prod. Folder, 16 ga., m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20—24" Dill, m.d.
48" Niles-Bement-Pond Geared, m.d.

TAPPERS

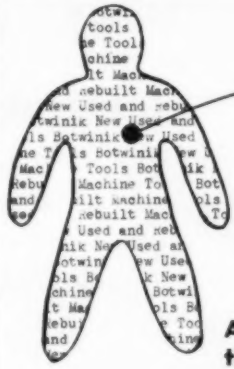
No. 1 Bakewell Precision, m.d.
No. 1R Bakewell Precision, Radial Tapper, m.d.
No. 5 Webster & Perks, belt
No. 10 Kaufman High Duty Oscillating Pneu., m.d.

SHAPERS

18" & 24" Invicta Shaper, m.d. thru gear box, new
24" Potter & Johnston, cone
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late
48" stroke Heavy Duty Morton H.D. Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO



FIT THE MAN IN YOUR SHOP!

Analyze his needs — then select the proper guaranteed machine tool from Botwinik's huge stock.

LATHES

Bridgeford 36"x56", M.D., mtsd. apron—48' C.D.
Niles Bement Pond 48"x24' G.H. 15' C.D.
American 30"x24' Medium Pattern G.H. 18' C.D., 2 carriages.
Lodge & Shipley 40"x8'6" C.D., Sel. G.H., M.D.
Bridgeford 36"x14', M.D. Gr. Hd., 7' C.D.

BORING MILLS

Yoder 3A, 3" Bar (late type).
Univ. 4" Bar Tri-Way (Late Type).
Univ. #44 Tri-Way 4½" Bar.
Bullard 24", 36" "Spiral Drive".

PLANERS

Cin. 78"x56"x22", 4 hds.
Cin. 60"x48"x25' Hypro, 4 hds.
Putnam 84"x84"x40', 4 hds., Rev. M.D.
Niles "Time Saver" 42"x42"x14' Rev. M.D.

FORGING MACHINES

United 2000 lbs. Board Drop.
Chambersburg 4000 lb. Board Drop.
Standard 1200 lbs. Auto. Drop, 1943 vintage.
Bradley 300 lb. Helve Hammer.
National 3", 5" & 7½" Upset Forging Mach.

RADIAL DRILLS

Cin. Bickford 6' 19" Super Service 1942.
American 4' 13" Triple Purpose.
2—Cin. 5' 13" M.D. thru 24 spd. Tumbler Gear Box.

MILLERS

B. & S. 3A Univ., motor-in-base.
Cin. 3B Univ., Motor-in-base vertical hd., and attch.
B. & S. 3B Plain Dbl. Overarm motor-in-base.
B. & S. No. 2 Plain Light Type.
Milwaukee No. 2H Plain (like new).

Ingersoll Hor. & Vertical spdl. Openside Planer Type, splines and keyway Milling Mchs.

PRESSES

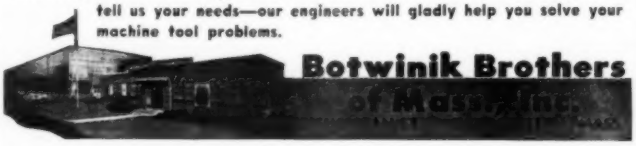
Toledo #59, 240 tons, S.S., 12" stroke.
Farquhar 100 ton Hyd. 36" stroke.
Niagara 612-C, 184 ton, S.S., Dbl. Crank, Dbl. BG, 12" stroke.

GRINDERS

B. & S. 1, 2, 3, & 4 late type Univ. Cyl.
3—Cin. #2 Centerless Filmatic Bearing Type "B" long bar fixture; auto. infeed att. for #2 centerless.

Rafter Shears (Now Immediate Delivery From Stock) 2 sizes ¼"x10' and 3/16"x12'.

Chances are the machine you need is not listed here. Write, wire or phone—tell us your needs—our engineers will gladly help you solve your machine tool problems.



PLANERS

48"x48"x12' Cincinnati Rapid Traverse, 4 heads
36"x36"x12' Woodward & Powell, 4 heads
32"x32"x10' Whitcomb, 2 heads
24"x24"x10' Whitcomb, 2 heads

Older Type machines, in excellent condition

HAZARD BROWNELL
350 Waterman St., Providence 6, R. I.
Dexter 8880

National Bent Shank Nut Tappers Battery of 5/8" to 1" Machines.
Waterbury-Farrel Fdry. 5/8" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

National Machinery Exchange
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BROACHES

3 ton American vertical
No. 1 Foote Burt duplex surface
9 ton American horiz. surface
Twin 10 Oilgear duplex
No. 3XA Oilgear
30 ton No. V48 American vertical
No. 3 Lapointe screw type

RADIAL DRILLS

3' Morris
4' Hammond elbow arm
4' Cint. Bickford universal
6' Dreses
6' Cincinnati Bickford
7' American triple purpose

GEAR CUTTERS

Nos. 3, 12 & Type T Barber Colman
Nos. 8H, 12H & 16 HS Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner
No. 5M Adams Mfg. hobber
12" Reed Ring gear shaver
8" Red Ring gear lapper
18" Gleason bevel tester & lapper
24" Flather auto. spur
No. 6 Fellows gear shaper
Cimatool gear chamferer

GRINDERS

Nos. 1 & 2 Brown & Sharpe universal
6"x18", No. 10 B. & S. Elec. hydraulic
10"x18" & 14"x36" Landis hydraulic
10"x36" & 23"x36" Norton hydraulic
Nos. 10 & 18 Blanchard rotary surface
12" & 16" No. 22 Heald rotary surface
18" & 24" No. 25A Heald rotary surface
10x24 Norton hydraulic surface
12"x48" Thompson hydr. surface
14"x60" Mattison hydr. surface
53", No. 372 Gardner horiz. disc
No. 115 Gardner opposed disc
30", No. 230 Hanchett opposed disc
Nos. 72A3 & 72A5 Heald internal
No. 16A18 & 24-36 Bryant internal
No. 2 Cincinnati centerless
Nos. 33 & 35 Excello thread
No. 2 Norton tool & cutter

LATHES, TURRET

No. 2 FU Foster Fastermatic
24" & 42" Bullard vertical
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 4 & 3AL Gisholt
Nos. 6, 2 Denver universal
Nos. 2G & 3 Morey
No. 601 DD Oster
Nos. 5 & 7 Bardons & Oliver

MILLERS, MFG.

24" & 48" Cincinnati duplex
No. 3—36 Cincinnati Hydromatic duplex
No. 18-36 Kearney & Trecker duplex
Nos. 1-12, 1-18, 2-18 & 2-24 Cincinnati automatic
Nos. 3-24, 4-36, 4-38, 5-60, 56-72 & 56-90 Cincinnati Hydromatic
Nos. M18, M24 & 12-24 Kearney & Trecker
Nos. 1, 1M & 3 Kent Owens
30", 42" & 84" Ingersoll Rotary
No. 0B Cincinnati, horiz. vertical or rise & fall
Nos. 4, 40 & CT36 Lees Bradner thread
Types C & D Hall Planetary

PRESSES

No. 2½ Toledo OBI
Nos. PA4 & CA4 Ferracute horning
Nos. 1½ & 1½C Bliss cam drawing
42", No. 90E Toledo double crank
Nos. 304 & 75½ Bliss straight side
No. 56 Toledo straight side
350 ton Clearing No. F1350-42
600 ton Hamilton No. 2316½
700 ton No. 7C Ajax forging
75 ton Southwark hydraulic
300 ton French Oil hydraulic
500 ton Clearing hydraulic

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LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER #B2 Di-matic Cut Off.
BROWN & SHARPE #2C High Speed, Latest Type
CLEVELAND 9/16" Model A, Latest Type
CONOMATIC 6"—4 spindle, Latest Type
CONOMATIC 2¾" 6 spindle, Latest Type
GOSS & DeLEEUW 8" Automatic Chucker, 5 spindles
NATIONAL ACME 9/16, 5 spindle, Model D, M.D.

BORING MILLS—Horizontal

CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
FRANKLIN 4½" Bar Table Type—M.D.
GIDDINGS & LEWIS #25, 2½" bar, M.D.
GIDDINGS & LEWIS #25T, 2½" bar, Latest Type
HEALD, #48A, #49 Single, double end Borers, latest
LANDIS—#35—3½" bar, floor type, M.D.
LUCAS #41, 3" bar, Table Type, Latest Type
NILES BEMENT POND 5", 6" bar, floor type
NILES BEMENT POND 8" bar, Floor Type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BULLARD 16", 6 spdls., Type D, Multi-au-Matic, Latest Type
BULLARD 36" Vertical Turret "Spiral Drive" LATEST
BULLARD 36" Vert. Turret, Motor Drive
BULLARD 61" "Mult-Mill"; 2 heads; M.D.
COLBURN 72"; 2 swivel heads; M.D.
KING 62", 2 swivel heads, PRF, M.D.
NILES 100", 2 swivel heads, DC., M.D.

BROACHES

AMERICAN V-2, 6 ton, Hyd., Latest
CINCINNATI 1-30 Duplex Vertical, Surface, Double Ram, Model ER, Hyd., Latest
CINCINNATI 3-30 Duplex, Vertical, Surface, Double Ram, Model ER, Hyd., Latest
LaFONTE 5-36 Vertical, Hyd., Latest

DRILLS—Miscellaneous

AVEY MA-8, 2 spdles., Latest Type
AVEY MA-6 3 spdles., Latest Type
BAKER 310 Single Spdle., Motor Drive
BARNES H-3 Hydram, Hyd., Latest Type
CINCINNATI BICKFORD 24" Box Column, Latest
DILLNO 1R, 2R, 2MS, Latest Type
FOOTE BURT #2, #3, M.D.
LELAND & GIFFORD #1 LMS, 4 spindle, Latest
LELAND & GIFFORD #2, #2MS, Single Spdle.
SNYDER 10"-18 Vert., Hyd., Latest

DRILLS—Multiple Spindle

FOOTE BURT 20 spindles, Hyd., Latest
ROLEY 10 Spdles, High Speed, Latest
PRATT & WHITNEY #12, 9 spdles., M.D.

DRILLS—Radial

AMERICAN 3' arm 9" column "Hole Wizard" Latest
AMERICAN 4' arm, triple purpose, plain, M.D.
AMERICAN 4' arm 11" col. "Hole Wizard" Latest
AMERICAN 5' arm 13" column, Plain M.D.
CIN. BICKFORD 6' arm 15" col. Plain or Univ. M.D.
DRESES 4' arm, 12" column Plain, M.D.
DRESES 5' ram, 15" column, Univ., M.D.
FOSDICK 3' arm, 14" column, Plain, M.D.
NILES 6' arm, 15" column, Univ., M.D.
WESTERN 6' arm, 20" column, Plain, Latest Type

GEAR CUTTING EQUIPMENT

BARBER COLMAN #12 Hobber, Single and Double Overarm, Motor Drive
BARBER COLMAN Type S Hobber, Latest Type
BROWN & SHARPE 6-72 Gear Cutter, Motor Drive
CROSS #1 Tooth Rounder; M.D.
FELLOWS #015, #02, #7A, #12, #125, #75, #77 High Speed Gear Shapers; Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #022 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, Latest Type
FELLOWS Model Z, Horiz., High Speed, Latest
FELLOWS SM Red Liner, Latest Type
GLEASON 27" straight bevel generator, latest type
GLEASON 10", 15" Spiral Bevel Generator, M.D.
GLEASON 11", 18" Straight Bevel Generator, M.D.
GLEASON #20 Spur Gear Tester, Latest Type
GLEASON #1, #9, #13, #18 Bevel and Hypoid Tester
GOULD & EBERHARDT 96H Hobber, with diff., M.D.
GOULD & EBERHARDT #36H Hobber, M.D.
GOULD & EBERHARDT 12HR Hobber, Latest Type
GOULD & EBERHARDT 12H Hobber, Latest Type
KOEPFER Model WMII Automatic Hobber—Latest
PRATT & WHITNEY 10" Grinder, Hyd., Latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, Universal, Latest
BROWN & SHARPE, #3 Plain, 3 x 12, Latest Type
BROWN & SHARPE #20 10x18 Plain, Latest Type

GRINDERS—Cyl.—Plain & Univ. (Cont.)

CINCINNATI 16 x 36" Plain "Filmatic", Latest
LANDIS 4 x 12, 4 x 18, Type H Plain Hyd., Latest
NORTON 6"x18", 6"x30", 14"x36" Type C Plain, Hyd., Latest Type
NORTON 10"x72" Type C, Plain, Mech., Latest

GRINDERS—Miscellaneous

BROWN & SHARPE #13 Cutter and Tool, Latest
BARBER COLMAN #3 Hob Sharpener, Motor Drive
BRYANT 5, #16-16, #16-CP-16, #24, Internal Hydraulic, Latest Type
CINCINNATI #3 Centerless, Motor Drive
CINCINNATI #2 Centerless, "Filmatic," Latest
CINCINNATI Centerless Lapper, Model ED, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
EXCELLO #667 Carbide, Latest
FITCHBURG 14" x 24" Spline, Hydraulic, Latest
GLEASON #12 Tool Sharpener, Latest Type
HEALD 50, 70 Internal, Motor Drive
HEALD, 75A, 72A2, 72A5, 74, 76A Internal; Latest
HEALD #72A3, 72A5 Internal "Gagematic", Latest
JONES & LAMSON 6x15, 8x18, Auto. Thread, Latest
LANDIS #12 Centerless, Latest Type
LANDIS #12 Centerless, Latest Type
LANDIS 5" Oscillating, External, M.D.
PRATT & WHITNEY Contour, Latest
THOMPSON 6" x 18" Auto., Round Broach, M.D.

GRINDERS—Surface

BLANCHARD #16, 24" Chuck, Motor Drive
BLANCHARD #11, 16", Latest Type
BROWN & SHARPE #2, 6"x18", M.D.
BROWN & SHARPE #5, 8"x24" Hyd., Latest
DO-ALL Model G-7, 9"x20", Hyd., Latest Type
GALLMEYER & LIVINGSTON #35, 8"x24"; LATEST
GLEASON 12" Spiral, Bevel Sharpener, M.D.
HEALD #22 Rotary, 12" Chuck, Latest Type
HEALD 25A—Rotary—16" and 30" Chuck, Hyd., Latest
KENT 6" x 18" Hand, Latest
NORTON 6x18 Hydraulic, Latest Type
PRATT & WHITNEY 8" Rotary, M.D.
THOMPSON 12"x12"x24" type B Hydr.; LATEST
THOMPSON 12"x12"x40" type B Hydr.; LATEST

JIG BORERS

FOSDICK #42 "Precision", Latest Type
PRATT & WHITNEY 1A, Motor Drive
VERSON, Precision, Latest Type

LATHES—Engine and Mfg.

AMERICAN 26" x 360" Centers, 2 Carriages, M.D.
BRIDGEFORD 36" x32" Red. 2 Carriages, M.D.
HENDEY 12 x 54" Centers, M.D.
HENDEY, 12x30, 14x30 Timken, Latest
JONES & LAMSON "Fay" 20 x 25" Automatic, Latest
KEIGHLEY LIFTS 8'/16 x 26" Centers Gap, Latest
LeBLOND 20" x 40" Centers, Geared, Motor Drive
LEHMAN 16 x 30" Centers, TIMKEN, Latest Type
LODGE & SHIPLEY 14"x30", 16"x30" Centers Latest
LODGE & SHIPLEY 18 x 72 Centers, M.D.
LOSWING 1x10, 4x18, 8x60, 8x144, 5x34, Latest
MONARCH 12 x 30" Centers; Timken; Latest Type
MONARCH 12" x 54" Centers, Timken, Latest Type
MONARCH 16 x 28" Centers, Geared Head, M.D.
MONARCH 10 x 20" Centers, Model EE, Timken, Latest
MONARCH 22"x156" Centers, 3 Carriages, Timken, M.D.
MONARCH 24 x 54 Centers, Geared, Motor Drive
MONARCH 10"x78" centers, Timken, Latest
NILES 26" x 48" Centers, D.C., M.D.
NILES 26" x 72" Centers, D.C., M.D.
NILES 56" x 100" Centers, D.C., M.D.
NILES 30 x 50' Boring, Timken, Latest Type
NILES 90"x110" Centers, Stand. Driving Wheel, M.D.
PRATT & WHITNEY 16"x60" Centers, Geared, M.D.
PRATT & WHITNEY 16" x 30" Centers, Latest
PRATT & WHITNEY 10"x20" Centers Bench, Latest
PUTNAM 42" x 25' Centers, Motor Drive
REED PRENTICE 16 x 24" Centers, Geared, M.D.
REED PRENTICE 20" x 54" Centers, Latest
REED PRENTICE 16" x 48" centers; geared; M.D.
SCHUMACHER & BOYE 24"x158" Centers, Geared, M.D.
SPRINGFIELD 14" x 6' Bed, Geared Head, M.D.
SPRINGFIELD 16"x6' Bed, Geared Head, M.D.
SPRINGFIELD 16"x30" Centers Timken, Latest Type
WARD, HAGGAS & SMITH—18/20 x 60" Centers Gap Motor Drive, Latest Type

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
FOSTER #48U "Fastermatic," TIMKEN, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, Univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5, Univ. Timken, Lat.
LIBBY "International" 1H5 Univ., Timken, Latest
MOREY No. 2G, No. 3, No. 4 Timken Bearing, Latest
POTTER & JOHNSTON 5D, 5D2E, Auto., Timken
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #2A Universal Motor Drive
WARNER & SWASEY #1A, Univ., Timken; Latest
WARNER & SWASEY #2A Universal, Timken, Bar & Chucking, Latest Type
WARNER & SWASEY #3 Universal, Timken, Latest
WARNER & SWASEY #1, 2, Ram, Timken, Latest

MILLING MACHINES—Mfg.

CINCINNATI 24", duplex, TIMKEN, M.D.
HALL Style D, Planetary, Latest Type
INGERSOLL 42"x38"x12" adj. rail, 4 heads, A.C., M.D.
INGERSOLL 32x24x16" Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x50x12" Adj. Rail Slab, M.D.
SUNDSTRAND Model 5A Duplex, Latest Type
TAYLOR & FENN M80 Duplex Spline, Latest

MILLING MACHINES—Plain

BRIGGS Type A, Hyd., 12" & 18" Feed, Latest
BROWN & SHARPE #12, 18"x24" Feed, Latest
BROWN & SHARPE #000, Timken, Latest Type
BROWN & SHARPE #3B, Timken, Latest Type
BROWN & SHARPE #2, Light, Timken, Latest
CINCINNATI 0-8 Automatic, Latest Type
CINCINNATI 2-18 Auto. Latest Type
CINCINNATI #4 TIMKEN, Motor Drive
CINCINNATI 2, 3, 5, Motor Drive
CINCINNATI 24" Automatic, TIMKEN, M.D.
CINCINNATI 4-36 Hydromatic, Latest Type
KEARNEY & TRECKER 12H, TIMKEN, Latest
KEARNEY & TRECKER #3, 4 Heavy Timken, M.D.
KEARNEY & TRECKER #2H, Timken, Latest Type
KEMPSMITH #3G, Timken, Latest Type
KEMPSMITH #4 Maxi-Miller, Timken, Latest Type
LeBLOND No. 4, Belted Motor Drive
SUNDSTRAND #3, Rigidmill, Timken, M.D.

MILLING MACHINES—Vertical

BROWN & SHARPE #2 Standard Timken, Latest
BROWN & SHARPE #5, M.D.
CINCINNATI #2, #4 Dial Type, Timken, Latest
CINCINNATI #08, TIMKEN, Latest Type
COCHRANE & BLY #14, M.D.
GORTON #4D, 9J Super-speed, Latest Type
KEARNEY & TRECKER 3H, Timken, Latest
MOREY 123M Profiler, Latest Type
REED PRENTICE 3VG, with or without Hydraulic Duplicator, Timken Bearing, Latest Type
SUNDSTRAND #3 Profile & Channel, Latest

MILLING MACHINES—Universal

AMES 2½"x19" Table, Latest Type
BROWN & SHARPE #4A Heavy, Motor Drive
HARDINGE Model UM, Timken, Latest
KEARNEY & TRECKER #2 Heavy, Timken, M.D.
KEARNEY & TRECKER #2H, #3H, Timken, Latest
KEMPSMITH #4 Maxi-miller, Timken, Latest
VAN NORMAN #12, Timken, Latest Type
VAN NORMAN #21, Duplex, M.D.
VAN NORMAN #36, Timken, Latest Type

PLANERS

CHANDLER 36"x36x20"—4 Heads, AC, M.D.
DETRICK & HARVEY 48"x48"x10'—4 Heads, Hyd.
GRAY 24"x24"x8' A.C. Motor Drive
GRAY 36"x36"x8'—2 Heads, Max. Service, D.C. Variable Speed, Motor Drive
LIBERTY 24"x24"x8'—Vari-Voltage, Latest Type
NILES 54"x54"x18'—4 Heads, Box Table, M.D.
NILES 60"x60"x16'—3 Heads, Box Table, M.D.
SELLERS 30" Plate Edge; motor drive
WOODWARD & POWELL 54"x54"x20', 4 Hds., M.D.

PRESSES

BIRDSBORO 325 Ton, Vert. Hyd., Latest Type
CHAMBERSBURG 50 Ton, Vert. Hydro-pneumatic
CHAMBERSBURG 200 Ton, Horiz. Straightening, M.D.
CLEARING Type DS-1125-32 Dbl. Action 125 Ton, Latest Type
CLEARING H-50-36 Vertical Hydraulic, Latest Type
FERRACUTE 2MG-55, 75 Ton Drawing, Latest Type
GLEASON 15" Quenching, Hyd., Motor Drive
HANNIFIN 15 Ton Moulding, Latest Type
HPM 37 Ton Vertical Hydraulic, Latest Type
LAKE ERIE 500 ton Vert., Hyd., Latest
LUCAS 30 Ton Forcing, Latest
NILES 600 ton, Horiz. wheel, Motor Drive
WATSON & STILLMAN 20 Ton Hyd. Straightening

SHAPERS & SLOTTERS

CINCINNATI 24" Crank, M.D.
DILL 20"-24" Vertical, Motor Drive
GOULD & EBERHARDT 16" High Duty, M.D.
GOULD & EBERHARDT 32" INVINCIBLE, M.D.
LAMAIRE 18" Vert. Hydraulic, Latest Type
LYND FARQUHAR 20" Openside, M.D.
NEWTON 15" Slotter, DC, M.D.
ORMEROD 8" Vertical, Latest Type
PRATT & WHITNEY 6", Vertical, M.D.
SMITH & MILLS 16" High Speed, Latest Type

MISCELLANEOUS

AJAX 1½" 5", 3½" Forging and Upsetting, M.D.
BAKEWELL #1, #1R Tapper, M.D.
BARNES #172, 306H, 307 Vertical Hone, Hydraulic, Self-Oiling, Latest Type
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
CAMPBELL #401 Abrative Saw, Latest Type
CLEVELAND 12"x16" Centers—Cutter Reliever, M.D.
GROB G-S 20 Band Saw, and Filer, Latest
HANSON & WHITNEY 4"x9" Thread, Miller, Latest
LANDIS 2" Bolt Threader, Motor Drive
MICHIGAN 1708A Cutter Reliever, Latest Type
MOREY 12x10", 120", 190" Thread, Miller, Latest
NAZEL #4B Pneumatic Hammer, M.D.
NORTON 2"P 10" Vertical Lapper—Latest Type
PELLOW #2 Nut Slotter, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, Latest Type 2 & 3 Dimensional
PRATT & WHITNEY (KELLER) Type G Copying Latest Type 2 Dimensional
PRATT & WHITNEY ½-8x50 Rifler, Latest Type
PRATT & WHITNEY 6"x60" centers, Thread Mill, LATEST
QUICKWORK ¾" and 1" capacity Rotary Shear; M.D.

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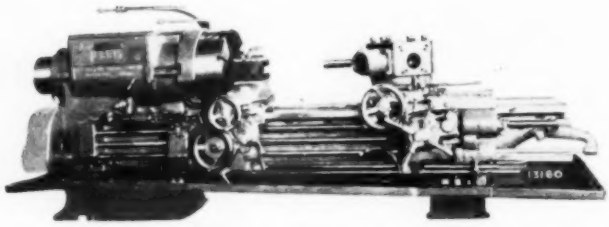

2H-10 Libby "INTERNATIONAL" Heavy Turret Lathe. Hardened Steel Ways, Six Hole Turret, 22" 4-Jaw Chuck, Taper Attachment, 10¼" Hole, Full Swing Side Carriage, Threading Attachment.

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- 36" Bullard, NEW ERA, 3-Jaw Chuck
- 42" Bullard, NEW ERA, 3-Jaw Chuck
- 36-44" Niles, Turret and Side Head
- 78" Betts, Fixed Rail, Plain and Turret Head
- 1¼"x14" Simmons Back Geared, Bar Feed
- 2½" No. 1A Warner & Swasey, 12" Chuck
- 3-AL Gisholt, 22" Chuck, Hardened Ways
- 2H-10 Libby "INTERNATIONAL", 22" Chuck
- 26" Libby, 7½" Hole, 4-Jaw Chuck

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2. #3 CINCINNATI UNIVERSAL DIAL TYPE MILLER COMPLETE WITH STANDARD EQUIPMENT.
3. #2 CINCINNATI CENTERLESS GRINDER, WITH IN AND OUT FEEDS, FILMATIC BEARINGS, late type.
4. #4D POTTER & JOHNSTON AUTOMATIC CHUCKING MACHINE, 1941, late type.
5. HANSON & WHITNEY THREAD MILLER, 8 x 16, late type.
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7. #13 A. C. CAMPBELL HYDRAULIC ABRASIVE CUTOFF MACHINE.
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10. #4 & #5 GISHOLT UNIVERSAL TURRET LATHES, LATE TYPES, WITH EQUIPMENT.
11. 3/16" HI-PRO HI SPEED W.F. F. D.S.S.D. HEADER.

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Dependable Service

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NEW SURPLUS REAMER SETS

Sets #0-10 Pin Reamers, 11 Reamers in Box, per set $7.50

Sets A-H Critchley Type Expansion Reamers, 15/32" to 1-1/16", 8 Reamers in Wd. Box, per set $16.50

Sets I-L Critchley Type Expansion Reamers, 1-1/16" to 1-25/32", 4 Reamers in Wd. Box, $16.50 set

Sets ¼" to 1¼" by 32nd Hand Reamers, 33 Reamers in Wooden Box, per set $30.00

Sets ¼" to 1" by 16ths Hand Expansion Reamers, 13 Reamers in Wooden Box, per set $32.50

Sets ⅛" to 1" by 16ths H.S. Machine Reamers, ⅛" to 9/16" Straight Shank, ⅝" to 1" #2 M.T.S., 21 Reamers in Wooden Box, per set $35.00

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LATE TYPE MACHINERY AT OLD TIME PRICES

AUTOMATICS

Brown & Sharpe #00G, H.S. (8)
Brown & Sharpe #4, #6
Conomatic 8 sp. 1⅞" cap.
New Britain #60, 1" cap.

BORING MILLS

Giddings & Lewis #8, #25T, #45
Lucas #31 horiz.
Universal 3" horiz. equipped
Bullard 24", 42" New Era V.T.L.

DRILLS AND RADIALS

Buffalo 18", 1" capacity
Cinci-Bickford Sup. Ser. 21", 24".
Delta Bench & Floor Models
Delta 4 spindle 2 P.F. spds.
Royersford Excelsior 21" B.G.
Natco Model E-5 Multi-Spindle
American Hole Wizard 3'-9" cel.
Canedy-Otto 3'-9" col.
Carlton 8'-10" col.

ENGRAVERS

Gorton #3U, 3Z, 2 dimensional
Gorton #3L, 3 dimensional
Gorton Model ME
Gorton Cutter Grinders

GEAR EQUIPMENT

Fellows #72, 725 High Speed
Mikron Gear Hobber
National Broach Checker and lead comparator

GRINDERS—Miscellaneous

Brown & Sharpe #5 cyl.
Brown & Sharpe #2, #3 Univ.
Brown & Sharpe #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati 12"x36" Univ. Filmatic
Covel #91A Univ. Tool & Cutter
Excello #44 Carbide
Gardner #226, 30 disc.
Hammond #4 Carbide
Heald Tool
K.O. Lee Tool & Cutter
Landis #4H Cyl. 4x12"
Landis #6 Thread
Landis Centerless Thread
Norton #2 Tool & Cutter
Norton Cyl. 6x18" Type C
Norton Cyl. 6x30" Type C
Oliver #510 Drill Pointer
Pratt & Whitney Radius #R6
Sellers #4G Drill Grinder
Black Diamond #1 Drill
Porter Cable Belt WG8, G8

GRINDERS—Surface

Abrasive #11½ Wet Hand Feed
Abrasive #34 Vertical
Atlantic 6x18" Power Feed
Brown & Sharpe #2 P.F.
Brown & Sharpe #5 Hyd.
G. & L. #18, 6x18" Hand Feed
G. & L. #25, 6x18" Hyd.
G. & L. #35, 8x24" Hyd.
Norton 6x18" Hyd.
Reid #2A P.F. MIB.
Reid #2C Pope Spdl. Hand
Pratt & Whitney 12x36" Vert.
Thompson Hyd. 6x10x18"
Thompson Hyd. 6x12x18"

LATHES

Hardinge Precision 9"
Hendey G.H. 12x30"
LeBlond Regal 15x30", 21x60"
LeBlond Regal 10"x31½", 19"x42"
LeBlond Heavy Duty 16x30"
Lodge & Shipley 10x78" T.A.
Logan 10"x30"
Monarch 10"x20" EE
Monarch 18x76 G.H.
Rivett Precision
Sebastian 12"x4' G.H.
Sheldon 11"x24", 1" collet
South Bend 9"x3' LCG
South Bend 9"x3½' QCG
South Bend 10" Toolroom 1" collet capacity, T.A.
South Bend 13x36", 16"x7'

MILLS—Vertical

Burke #4 Plain & Univ. Vert. Hd.
Cincinnati #3 Plain
Milwaukee #2NL, 2H Plain
Milwaukee #2H, 3H Univ.
Van Norman #12, 26, 36
Van Norman #22LU Univ.

MILLS—Plain & Universal

Bridgeport, Slotting Attach.
Brown & Sharpe #2 (2)
Cincinnati #4 Dial Type
Gorton #3D, 9J Plain
Gorton #9½D, 9J Duplicator
Fosdick Jig Borer #30A
Sip Jig Borer #MP-5
Morey #12M Profiler 2 sp.

MILLS—Production

Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 2-16 Mfg.
Kent Owens #1V, 2-20
Nichols Hand, Vert. Hd.
Van Norman Production

PRESSES

Bliss #675 Hi-Production
Bliss #21 O.B.I.
Bliss #58 O.B. Gap Frame
Bliss #4½ Double Action
Bliss #62, 62A, 162
Diamond #31 O.B.I.
General Flexible Elec. Screw
Henry & Wright 75 Ton Dieing
L. & J. #4½, 40 Ton O.B.I.
Thomas 80 Ton O.B.I.
Toledo 400 Ton Knuckle Joint
V. & O. #25B O.B.I.
V. & O. #102 Reducing, O.B.I.
Z & H 30 Ton O.B.I.

NEW IN STOCK

Air Hydraulic Presses
Arbor Presses #6C Famco
Band Saws Kalamazoo
Drill Presses all sizes
Grinder Surface, Abrasive #11½
Hydraulic Press Northern 20 Ton
Injection Molders, 1 ounce
Power Presses, Famco 4½, 7½ Ton
Power Presses, Rousselle O.B.I. & Horn
Power Presses Pressrite OBI, 5, 10, 12, 18, 30 ton cap.
Shaper, 7" Ameo, 8" Shaprite
Shaper, Sheldon 12"
Shears, Foot 22" to 8', 16 & 18 ga.
Shears, Power, 3'x18 gauge to 10'x10 ga.
Welders, Arc, Seam, Spot all sizes
Vert. Milling Attach. Halco, HS
Motors, Grinders, Buffers, all sizes

HYDRAULIC EQUIPMENT

500 TON LAKE ERIE PRESS

Platen 35"x36", 36" stroke, 68" opening, 150 H.P. 220-440 V. Motor.
600 Ton Baldwin South. Platens 76"x30, Stroke 22", Opening 36".
500 Ton H.P.M. Double Action with 100 ton cushion. Platen 36"x36", Stroke 24", Opening 36".
1000 Ton French-Oil Bed 53x42", stroke 20" daylight 56".
Brand New 300 ton Watson-Stillman Hobbing Press & Pump.
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

350 TON VERSON PRESS

40x40 Platen, 36" stroke, 72" opening, 100 H.P. 3 phase—60 cycle 440 volt.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

LATHES—Turret

Acme #6W Bar & Chuck
Bardons & Oliver #3, #5
Brown & Sharpe #1, 2F, Hand
Foster #3B
Gisholt #4, 5 Bar & Chuck
Hardinge ESM Second Operation
Oster #501 Rapiduction
Morey #3, 1½" cap.
Warner & Swasey #3 Universal
Warner & Swasey #4, Air Chuck

MISCELLANEOUS

BAND SAW; Doall #V28
BAND SAW; Tannewitz #36M
BENDING ROLL; Buffalo #0
EYELETTER; Peerless #22S
FILER; Oliver, HEAVY DUTY
HACKSAW; Marvel #4B
HACKSAW; Marvel #8A Automatic
HARDNESS TESTER; Clark
HAMMER; Niles Bement Pond 2500 lbs. steam
HAMMERS; Rochester Rivetting
HONER; Micromatic #H-1
INJECTION MOLDER; Hood-Prentice #10D6, 6 ounce
IRONWORKER; Buffalo 25UD
KEYSEATER; Davis #4'
PLASTIC GRINDER; Ball & Jewel
PRESS BRAKE; #253 Chicago
ROUTER; Onsrud #W249
SHAPER; 8" Shaprite
SHEAR; Pexto, 6'x14 Ga. Power
SHEAR THROATLESS; #13B Lenox
SPEED LATHES; Cincinnati
SPEED LATHES; Schauer
TAPPERS; Bakewell #1
TAPPERS; Haskins #2C, 3C
THREAD ROLLER; Waterbury-Farrel #30 with Dies, complete
WELDERS, Seam; Thompson
WELDERS SPOT; Taylor-Winfield 50 KVA
WELDERS SPOT; Sciaky

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AARON MACHINERY CO., Inc.

45 Crosby Street — **New York 12, N. Y.**
WO rth 4-8233 — **Cable: AARMACH, N. Y.**

MONA MEMBER

Late Type — **EVERY MACHINE TESTED AND GUARANTEED AS REPRESENTED** — *Immediate Delivery*

LATHES

SOUTH BEND, 10"x31½", 14½"x6', 16"x8'
BRADFORD, 18"x8'
CLAUSING, 13"x5' M.D.
HENDEY, 16"x8', taper attach.
RIVETT, No. 608 taper attach. precision
LE BLOND 'REGAL', 13"x6'
ELGIN & HARDINGE PRECISION, 1" cap.
PRATT & WHITNEY, 10"x30", precision
PRATT & WHITNEY, 13"x6', taper attach.
SIDNEY, 18"x16', taper attach.
SEBASTIAN 12"x6' QH M.D.
AMERICAN 18"x8' M.D.
SPRINGFIELD 16"x6'; Motor in Base, 12 speeds
MONARCH 14"x8' GH, QC, TA.
AMERICAN 26"x13' GH, QC, TA.
AMERICAN Pacemaker 16"x54" latest
REED PRENTICE 20"x8', Late, 1943.
MONARCH 18"x6' Model C.

TURRET LATHES

GISHOLT, bar equip. preselector, #5, #1L
WARNER & SWASEY, #1A chucking
FOSTER, #5 universal, bar feed
SIMMONS MICRO-SPEED, 1¾" cap. bar feed
WARNER & SWASEY #1, 1¼" cap. hand.
BROWN & SHARPE #1 Hand Screw
BARDONS & OLIVER #8 Preselector 2" cap.

SHAPERS

Gould & Eberhardt, 26" Industrial
Stockbridge, 16" M.D.
Atlas on steel bench 7" M.D.
Shaperito floor model 8" NEW

DRILL PRESSES

American Radial, 4'x11" column
Avey, #2 single spindle, 15" overhang
Leland-Gifford, #2, single spindle
Allen, 6 spindle, #2, 12" overhang
Buffalo #22 DG, FF, #4 MT.
Cleerman drill box col. 25", #4 MT.
Fondick 4 Sp. #5 BM, #3 MT.

GRINDERS

BROWN & SHARPE #2 Universal
NORTON #2 Universal Hydraulic Tool & Cutter
COVEL, #81A, tool & cutter universal
LANDIS, cylindrical, type H, 4"x12"
HEALD #71A3, plain internal, HYD.
BLANCHARD, VERTICAL SURFACE, #16, 36"
BLANCHARD, VERTICAL SURFACE, #11, 16"
ABRASIVE, VERTICAL SURFACE, #33, 6x24"
BROWN & SHARPE, #5 surface, hyd.
REID, SURFACER, 3D Pope spindle
RIVETT #104—Int.—Ext. Latest
BROWN & SHARPE #2 & #3B Surface
Excello Thread Grinder #23
GALLMEYER & LIVINGSTON 12x24 Hydraulic
Do-All Hyd. Surface Grinder 6"x18"
Cincinnati Universal Grinder 12"x30", ext.-int.
Wiesco Precision Internal
Cincinnati cylindrical 12x72" centers

PLAIN MILLERS UNIVERSAL

BROWN & SHARPE, #2A, UNIVERSAL
BROWN & SHARPE, #2B, PLAIN
BROWN & SHARPE, #3, UNIVERSAL
CINCINNATI, #2MH, Universal
BROWN & SHARPE #3 Light Type, Vertical Head
VAN NORMAN 2-⅝ and #12 Duplex Ram type
VERNON Miller, motor in base
CINCINNATI #2 plain M.D.
HENDEY universal #2B Vert. attach.
PRATT & WHITNEY #12B Profiler 2 sp.
LEES BRADNER Thread Miller 12"x54" HT
VAN NORMAN 22L Plain

VERTICAL MILLERS

CINCINNATI, #3, #4, dial type
VAN NORMAN, #3V, rapid traverse
KEARNEY & TRECKER, #3KM, dial type
KEARNEY & TRECKER, #3H, dial type
PRATT & WHITNEY Jig borers #2
MOORE Jig Borer
SWISS Jig Borer #5B Univ. Table

PRODUCTION MILLERS

WALTHAM thread miller, ext. & int.
CINCINNATI, #1-12 automatic
KEARNEY & TRECKER, #1H-16 Mfg. type
BROWN & SHARPE #4M, high speed

GEAR MACHINERY

FELLOWS #51A
GLEASON, 18" and 24" cap. Bevel Gear Cutters
GOULD & EBERHARDT, #735, spur gears
Barber Coleman #12, 12" cap.
Gleason 3" straight bevel.
Gleason 3" spiral Gear Cutter

AUTOMATIC SCREW MACHINES

BROWN & SHARPE, #0G, ⅝" cap.
BROWN & SHARPE, #2, high speed
BROWN & SHARPE, #0G, high speed ⅝" cap.
ACME GRIDLEY 3" cap. RA6
ACME GRIDLEY 1" cap. RA6

BOREMATICS AND BORING MILLS

Defiance #25A Horizontal 2¾" Bar
Lucas No. 41, 3" cap. extra long table

MISCELLANEOUS

Niagara 6'x10 gage, 16" gap
Diebel Hi-speed and roll feed
Hydraulic Press 25 ton to 750 ton
Bliss Incl. #20 roller pin clutch
Roesch #2 percussion press, 60 ton
DoAll continuous bandfiler Model BF
Riveting Hammers, high speed, #5A
Spot Welders 5 KVA to 100 KVA
Famco Foot Presses, #6, #8, #10, #12, #15
DoAll ML Contour saw

ROWBOTTOM Cam Miller

Sonntag Combination punch & shear #16 with notcher, M.D.

Watson Stillman 200 ton hobbing press with duplex pump.

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253 CENTRE STREET — **NEW YORK 13, N. Y.**

MDNA MEMBER

LATE TYPE TOOLS

ALL AVAILABLE FOR PROMPT DELIVERY

Jones & Lamson #9A Saddle Type Univ. Turret Lathe M.D.—Equipped for Bar Work with Power Bar Feed—3½" Cap.—Considerable Tooling

Sellers Model #6T Wet Tool Grinder—M.D.—with all attachments

LATHES

AMERICAN 16"x102" Pacemaker
LODGE & SHIPLEY 14"x30" Selective Head
MONARCH 16"x30" Model CW
SEBASTIAN 16"x8' Geared Head (NEW)
SOUTH BEND 14½"x8'—T.A. (2)
SOUTH BEND 16"x12'—T.A.
(3) LEBLOND 13" Rapid Production
(1) FAY & SCOTT 20"/40" Gap—M.D.

TURRET LATHES

B&S #2 Wire Feed (2)
GISHOLT #5 Univ.—Air Chuck
GISHOLT #3R Saddle Type—Bar & chucking
W&S #3 Univ.—Air Chuck
W&S #4 Univ.—Bar

MILLING MACHINES

(7) B&S #2A Univ.
B&S #2 Light Type Univ.
CINCINNATI #2 Dial Type HiSpeed Vert.
CINCINNATI #1-12 Production
K&T #2HL Plain
K&T #2K Plain
K&T #3H Plain
K&T #2K Vert.
K&T #3H Vert.
"NICHOLS"—Hand (4)
VAN NORMAN #2S Plain

GRINDERS

LEES-BRADNER #40 Thread
VAN NORMAN #20 Duplex

ARTER #A3—12" Surface
BLANCHARD #11—20" Surface
(6) ROBOT 6"x18" Surface
B&S #1 Universal
CINCINNATI #2 Centerless
GRENBY 1G—12 Internal
(2) LANDIS 10"x24" Universal
LANDIS #4H 4"x12" Cyl.
NORTON 6"x18" Type C Cyl.
NORTON 12"x36" Mult. Purpose
NORTON #2 Cutter & Tool

DRILLS

CANEDY-OTTO 21" Box Col. Upright (2)
LELAND GIFFORD 1LMS Sing. Sp.
LELAND GIFFORD 1LMS—6 Spindle
LELAND GIFFORD 2LMS—Sing. Sp.—Pw. Fd.
ALLEN #2 Motor Spindle—2 sp.

MISCELLANEOUS

PRATT & WHITNEY #12B—2 spindle Profilers
(5) ROCHESTER 3" Bar Hor. Boring Mill
(4) FOSTER Superfinisher
BLISS #4 Stiles Type Press—45-ton (4)

UNITED MACHINERY AND TOOL CORP.

85 CENTRAL ST. — **WORCESTER, MASS.**

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36", Surface 12"x12", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10—16"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized
Large stock 18" and 18" bench and floor type.

Planers—Single head 24"x8', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" HI Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilting for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88, Columbus 16, Ohio

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HILL-CLARKE'S T. H. PRICE, Secretary, *left*, W. L. DITFURTH, V.P. & Treasurer, *right*, together offer customers benefit of their 73 years experience in detecting inferior equipment, and in careful selection and purchase of only late model machine tools in good condition.

FOR YOUR PROTECTION ONLY HILL-CLARKE OFFERS YOU THIS 5 WAY GUARANTEE

1. A responsible organization—82 years experience
2. Modern machines — no worn out equipment
3. Every machine remanufactured or carefully inspected by experienced craftsmen.
4. You can see your machine tested under power.
5. Hill-Clarke's unconditional money-back guarantee.

AUTOMATICS

No. 2 Brown and Sharpe
1⅛" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅛" (1942)
No. 6 Brown & Sharpes
No. 49 New Britain, 4 Spdl. Chucker
Model A 2½" Cleveland

DRILLS

No. 150 Baker
No. 314A Baker
No. D8 Colburn No. 6 Morse Taper
No. 1LMS—20"—5 Spdl. Leland-Gifford
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—26"—4 Spdl. Leland-Gifford
No. 2LMS—26"—6 Spdl. Leland-Gifford
No. 3B—24"—6 Spdl. Edlund (1942)
No. 4BL Natco 36 Spdls.
6'-17" Col. Fosdick Radial
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61-A Fellows Gear Shaper
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
#16 HS Gould & Eberhardt
No. 18H Gould & Eberhardt
No. 6 Gleason Gear Tester
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas, 3" bar
No. 46-B Heald Bore-Matic
#112-C Excello 2 Spdl.

GRINDERS

3"x12" Brown & Sharpe #5
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders
6"x18" —— to —— 24"x240"

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 25A—24" Heald Rotary Surface (1943)
No. 36-A Hanchett Rotary Surface

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-36 Bryant Internal Grinder (1942)
No. 24—26 Bryant Internal Grinder (1941)

LATHES

15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
16"x80" centers Pratt & Whitney, Model B
18"x6' American, Grd. Head
19"-36" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydratrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x16" Sundstrand
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)
R-14 Seneca Falls Lo-swing

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 2 H Milwaukee Vertical
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cinn. Mig. (1940)
No. 3—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
8"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Col. Face Millers (1942)

MISCELLANEOUS

19" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
Model H-100 Micromatic Hydro Honer
Model 200—HS Micromatic Horiz. Hone
8" M Wells Band Saw
No. 20 Bliss O.B.I. Press
No. 2 V & O open back press
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

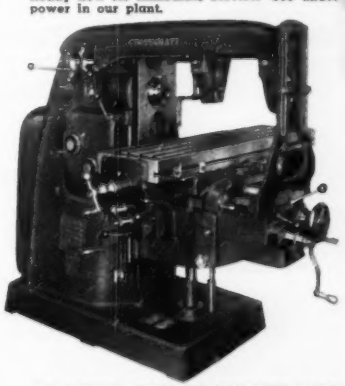
No. 3 Jones & Lamson Bar Feed
No. 4R Libby, Bar Feed
No. 5 Warner & Swasey (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Midland, Bar Feed
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle
No. H-5 Libby

VERTICAL BORING MILLS

42" Bullard New Era
42" Colburn
60" Colburn
72" Niles Extra Heavy
84" Betts

FEATURE OF THE MONTH

No. 4 Cincinnati Hi-Speed Dial Type Plain Milling Machine. Late model, quiet running. Ready now for immediate service. See under power in our plant.



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THE "LIKE NEW" PERFORMANCE WITH CIMCO REBUILT TOOLS

AUTOMATICS
#1 B & S Hand Screw Machine
#4 B & S Hand Screw Machine

ALL SIZES NEW HACK SAWS

DRILLS—RADIAL
5'-15" Column Carlton Radial Drill
2'-6' Plain Radial Drills
7' American
7' Cincinnati Bickford, gr. box
4' Carlton, gear box
6' American Triple Purpose
5' Foodick Plain, Gear Box

GRINDERS—PLAIN
#12 Brown & Sharpe Plain Grinder
10"x24" Landis C Hyd. Univer. Grinder
No. 2 Landis Univ. belt drive
16"x72" Landis, belt drive
18"x72" Cincinnati, latest type
20"x240" Landis, M.D.

GRINDERS—TOOL & CUTTER
#51 Oliver tool grinders
#13 Brown & Sharpe Cutter Grinding Machine
#2 Cincinnati Tool & Cutter Gr. New 1942

GRINDERS—SURFACE
6"x18" Thompson Hydr. Surface grinder
14"x18"x72" G & L Model A Hyd surface grinder
12"x48" Cincinnati Grinder

LATE TYPE
20" Cincinnati Univ. Shaper

EXCEPTIONAL BUY
18" x 54" Lodge & Shipley Lathe, late type.

LATHES
#6 LeBlond Multi-cut
18" Rivett Bench Type
14"x5' Lodge & Shipley Belt dr.

LATHES (Cont.)
14"x6' LeBlond Gr. Hd.
14"x6' Lodge & Shipley cone belt dr.
16"x6' American Belt drive
16"x8' American Screw Cutting Engine Lathe
18"x6' Boye & Emmes Belt drive
18"x9' L & S Bowl hd.
19"x8' Sidney Lathe Bowl Type
20"x10' Lodge & Shipley Belt dr.
24"x12' American 3 Sp. Gr. Hd.
24"x22' Lodge &Shipley Gr. Hd.
25"x12' LeBlond Gr. Hd.
36"x36' American Geared Head
30"x10' Centers Niles Timesaver
Niles 30"x10' centers, time saver, GH. late type

TURRET LATHES
21" Gisholt Turret Lathe
1L Gisholt Turret Lathe
#4 Millholand
2½x24" J & L Flat turret
3½x32" J & L Flat turret
36" Bullard Univ.

MILLING MACHINES
Sundstrand 00 Hydraulic
#11B Van Norman Production Millers
28" Cincinnati Semi-Automatic
New Burke Hand Millers
1½ BS Double overarm miller
3S Cincinnati Plain
2B—B & S motor in base
#2M Cincinnati Vert. Mill
#4 Cincinnati Horiz. Dial Type
#3 Cincinnati Medium Speed Dial type, Vert.
40" Ohio Tilted Rotary Miller

UNUSUAL BARGAIN
#4 Cincinnati Vert. Miller, Late Type

PLANERS
30"x30"x20" Gray Planers
42"x42"x20" Cincinnati Planer
72"x72"x20" Niles Bement Pond
42"x42"x20" Cincinnati Hypo

SHAPERS
15" Smith & Mills
20" G & E Shapers
20" Ohio Belt Dr.
24" Cincinnati Belt dr.
24" Potter & Johnson

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Cincinnati 2, Ohio

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2—Thompson Type 4C—12"x16"x48" Hydraulic Surface Grinders, Heavy Duty —30 HP Direct Spindle, Takes 20"x 6"x12" Wheels. One Used 5 Months, One Used 12 Months. *Like New.*

1—New Britain Model 665 Automatic Chucking Machine, Complete with Tooling, Now Set for Size A—V Belt Pulleys. *Is in Perfect Condition.*

1—Sunstrand, Model 33 Rigid Mill Fluid Screw—48" Table Travel for Conventional, or Climb Milling. 10 HP Motor for Spindle, 3 HP Motor for Hydraulic Power. *Perfect Condition.*

1—Sunstrand, No. 1 Hydraulic Rigidmil Type "B" Range of Spindle Speeds from 40 to 2400 RPM. Suitable for Conventional or Climb Milling—3 HP Motor for Spindle, 1 HP Motor for Hydraulic Power, *Like New.*

2—Cincinnati 08 Plain Automatic Milling Machines, Complete with Change Gears and Arbors, Used Only 14 Months. *Perfect Condition.*

Can be seen at our plant under power.

Commercial Grinding & Mfg. Co.
3890 BUCHANAN, S.W.
GRAND RAPIDS, MICHIGAN

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18" Carroll Lathe, 6' between centers, Lima drive quick change, 4 jaw chuck.

18" Nebel Lathe, 7' between centers, taper attachment, 4 jaw chuck.

Grinder, 12"x24", Landis O.D. & I.D. hydraulic feeds.

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60" Bullard Vertical boring mill, with 15 H.P. Motor.

48"x12' Cleveland openside planer, one head on rail, one head on side with motor generator. Can be seen in operation.

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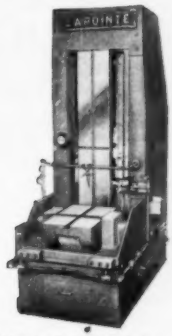

MODEL SRV 25-66 LAPOINTE Vertical Variable Speed Hydraulic Surface Broaching Machine, maximum capacity 40 tons, stroke 66". Latest model.

AUTOMATICS
Bullard Mult-Au-Matic, 6 spdl. Model D. 1941.
6" Goss & DeLeeuw Chucker, 8 spdl. 1943.
9/16" RA-6 Gridley. 1943.
9/16" RA-6 Acme Gridley Chucker. 1942.
No. 60 New Britain, 6 spindle. 1942.
No. 1½B Cleveland. Late.
Model 3-8 Ceco. Late.

BORING MACHINES
3" Yoder Boring Mill. 1942.
No. 49 Heald "Bore-Matic". 1942.
No. 47A Heald "Bore-Matic". 1942.
No. 2112A Excello. 1943.

BROACHES
No. CPC 6-30 LaPointe Vert. 1941.
6 Ton American Vertical, Late.

DRILLS, HEAVY DUTY
No. H3 Barnes Vert. Hydram. 1942.
25" Fosdick Economax. 1941.
24" Sibley Sliding Head. 1942.
No. 3 Bausch Multiple Spindle.
Fox Multiple Spindle. 1944.
Barnes 2 Spindle Deep Hole. 1943.
No. ⅛ B P & W Deep Hole. Late.
No. ⅛ B P & W Reamer. Late.
No. ⅛ B P & W Hyd. Rifler. Late.

DRILLS, RADIAL
6' 17" Carlton. 1942.
3' 9" Dreses. Late.
20" Pfiffner Drillmaster. 1942.

DRILLS, SENSITIVE
20" Walker Turner 6 Spindle. 1942.
No. KH2 Allen, 6 Spindle. 1943.
16" Atlas, 4 Spindle. 1942.
15" Atlas, 4 Spindle. 1942.
14" Delta. 4 Spindle. 1942.
No. 2 Motor Avey, 4 Spindle. 1943.
No. 2 MS Allen, 1 to 3 Spindle. 1942.
No. 2 Motor-Avey, 3 Spindle. 1942.
No. 2B-8 Edlund, single spindle. 1942.
No. 2 Hamilton-Muehlmat. 1943.
Leland-Gifford, Single Spindle. 1942.

GEAR EQUIPMENT
3" Gleason Bevel Gear Gen. 1942.
No. 715 Fellows Gear Shaper. Late.
No. LS Fellows Gear Lapper. Late.
No. 6 Gleason Tester. Late.
No. 12 Gleason Tool Sharpener. 1942.
Model GCL-3 Red Ring Gear Shaver. 1942.
No. 860B Michigan Gear Shaver. Late.
15" Red Ring Gear Lapper. 1942.
Red Ring Universal Gear Checker. Late.
Type S Barber-Colman Hobber. 1942.
No. 140 Cleveland Hobber. 1942.
Vinco Spline & Gear Grinder. 1942.
No. 7125A Fellows Gear Shaper. 1943.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
14"x36" Norton Type C Universal. 1943.
12"x48" Cincinnati Universal. 1943.
10"x24" Landis Type C Universal. 1942.
10"x18" Norton Type C Plain. 1942.
6"x30" Cincinnati Plain. 1943.
6"x24" Norton Plain. 1936.
6"x18" Landis Type C Plain. 1941.
6"x18" Norton Type C. 1942.
4"x12" Landis Type H Plain. 1942.
No. 2 Brown & Sharpe Universal, Late
No. 5 Brown & Sharpe Plain. Late.
No. 2 & 3 Cincinnati Centerless. 1942.

GRINDERS, INTERNAL
No. 81 Heald "Sizematic". Late.
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald, two motor. 1943.
No. 72A3 Heald Plain. 1942.
No. 72A5 Heald Plain. 1944.
No. 16A22 Bryant Internal. Late.
No. 5 Bryant Internal. Late.
No. 104 Rivett. 1942.

GRINDERS, SURFACE
16"x16"x48" Thompson, Type C. 1943.
14"x36" Pratt & Whitney Vertical. 1942.
6"x18" Robot. 1942.
72" Rogers Knife Grinder. Late.
No. 2B Reid. 1944.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.
6" Taft Pierce Rotary. Late.
A-18 Arter Rotary. 1942.

GRINDERS, TOOL & CUTTER
No. 2 Cincinnati Univ. 1941.
No. 13 Brown & Sharpe Univ.
No. 91A Covel Universal. 1942.
No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide Tool. 1942.
No. 6G Sellers Drill Grinder. 1942.
Barber-Colman Combination. 1943.
No. 44, 48 & 49 Excello. 1942.
Milwaukee Face Mill. 1942.
No. P5 Burr Way Carbide Tool. 1942.

LATHES, ENGINE
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.
14"x30" American "Pacemaker". 1944.
16"x8' South Bend e.d. 1944.
14"x54" Reed Prentice. 1942.
14"x30" Lodge & Shipley. 1943.
14"x6' Hendey.

LATHES, PRODUCTION
Model 10 Sundstrand. 1942.
Model 8 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic." 1941.
12"x18" Lipe "Carbo". Latest.
9"x20" Lipe. 1942.
8"x36" Lo-Swing Semi-Auto. 1942.
8"x21" Fay Automatic. 1942.
Model IMP & R Lo-Swing. 1942.

LATHES, TURRET
No. 2A Warner & Swasey.
No. 1A Warner & Swasey. 1944.
No. 9A Jones & Lamson. 1942.
No. 1 Acme Universal. 1941.
8¼"x24" Acme. 1943.
No. 3L Gisholt. Late.
No. 2L Gisholt. 1943.
No. 5 Warner & Swasey. 1941.
No. 4 Warner & Swasey. 1941.
No. 3 Warner & Swasey. 1943.
No. 2 Warner & Swasey. 1941.
No. 2, 5 & 7 Bardons & Oliver. 1941.
No. 3 & 4 Gisholt. 1943.
No. 4 Midland. Late.

MILLING MACHINES, PLAIN
No. 3B Brown & Sharpe. 1941.
No. 2H Milwaukee. Late.
No. 2HL Milwaukee. 1942.
No. 2M Cincinnati.
No. 2B Brown & Sharpe.
No. 3 Van Norman. 1942.
Van Norman Hand Mill. 1942.

MILLING MACHINES, PRODUCTION
No. BL2420 P & W "Keller", 3 spindle. 1942.
No. BL2416 P & W "Keller", single spindle. 1943.
No. BG "Keller" single spindle.
No. 34-36 Cincinnati "Hydromatic". 1942.
No. 3-36 Cincinnati "Hydromatic". 1943.
No. 1248 Milwaukee "Simplex". 1942.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati. 1942.
No. 12 Brown & Sharpe. 1942.
No. 1-8 Kent Owens. 1942.
No. 1-14 Kent Owens. 1943.
No. 2-20 Kent Owens. 1942.
No. MM-1-5-2 U.S. Multi-Miller. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 0 & 2 Sundstrand. 1943.

MILLING MACHINES, THREAD
12" & 54" Lees Bradner. Late.
8"x16" Hanson-Whitney. Late.
6"x60" Pratt & Whitney. Late.
4½"x12" Pratt & Whitney. Late.
4"x9" Hanson.

MILLING MACHINES, UNIVERSAL
No. 2 SU Van Norman. 1942.
No. 2H Milwaukee. 1942.
No. 2 MH Cincinnati Univ. 1942.

MILLING MACHINES, VERTICAL
No. 2 Milwaukee, Model D. 1945.
No. 3K Milwaukee. 1942.
No. 3H Milwaukee. 1940.
No. 2K Milwaukee. 1942.
No. 3 Cincinnati. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.
No. 1 Cleveland. 1942.

MISCELLANEOUS
6'x½" Bertsch Bending Roll. Late.
10'x14 Ga. Chicago Press Brake. Late.
No. 333 Chicago Press Brake. Late.
No. 405 Williams Turnings Crusher. 1943.
200 Lb. Bradley Helve Hammer. 1941.
No. 7B High Speed Riveting Hammer. 1942.
J & L Comparator. Late.
50KVA Federal Spot Welder. 1942.
Model MA Sunnen Hone. 1942.
No. 616 Cleveland Rigidturner.
No. 26 F Norton "Hyprolap". 1942.
No. 74 Excello Center Lapping Mach. 1942.
3' Leland Gifford Radial Tapper. 1941.
No. 1 Savage Roller Type Nibbler. New.

PLANERS & SHAPERS
52"x36"x40' Cincinnati Planer.
36"x36"x16' Ohio Planer.
16" Gould & Eberhardt Shaper.
12" New Haven Vertical Slotter. Late.
6" Pratt & Whitney Vertical Shaper.

PRESSES
100 Ton Hanneßn Hydraulic. 1942.
50 Ton Denison. Late.
45 Ton Reliance. 1942.
No. 8-6 Zeh & Hannemann. 1942.
No. 1 Ross O.B.I. Late.
No. 18 Bliss O.B.I. Late.

SAWS
14"x20" Racine "Shear Cut". 1942.
13"x13" Peerless Universal. 1943.
No. 6 Wells Band. Late.

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HEADLINERS

LATHES

18"x12' LODGE & SHIPLEY Selec. Grd. Hd., AC MD
24"x12' AMERICAN Grd. Hd., AC MD
12"x30" MONARCH Model C Tool Room
14"x6' AMERICAN 12-speed Grd Hd, AC MIB, Taper
14"x8' AMERICAN 12-speed Grd. Hd., AC MD, Taper
15"x10' SEBASTIAN "Gold Seal" Grd. Hd., AC MD, taper
16"x8' LODGE & SHIPLEY Selec. Grd. Hd., AC MD, taper
17"x8' LeBLOND Hvy. Duty, with AC MD
20"x8' LODGE & SHIPLEY Selec. Grd. Hd., AC MIB, taper
22"x10' ROCKFORD 3 SCD DBG bowl hd.
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x14' LODGE & SHIPLEY, Turner Drive, Taper
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS

#1—18" CINCINNATI Auto. Plain, backlash elim., 1943
Type "P" OHIO Production Miller, new 1943
#2 CINCINNATI H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#2B MILWAUKEE Plain, AC MD, DOA
#2M CINCINNATI Plain, AC MIB, Timken, #50 spindle
#3 KEMPSMITH Univ., self-cont. AC drive, div. hds.
#3B MILWAUKEE DOA Plain, AC MIB, PRT
#4 CINCINNATI H.P. Univ., Lima Drive, div. hd., slot attach.
#4B BROWN & SHARPE Plain, AC MIB, DOA, #50 spindle

SHAPERS & PLANERS

14", 24", 28", 32" GOULD & EBERHARDT High Duty
28" AMERICAN H.D., AC MD
30"x30"x8' CINCINNATI, AC MD
36"36"'x12' NILES-BEMENT-POND, AC MD, 4 hds., box table
36"x36"x16' GRAY, AC MD, 4 hds.

RADIAL DRILLS

4' MORRIS, Enclosed Head, AC MD
6' CINCINNATI-BICKFORD mtr. on arm
7' DRESES, 17" col., AC MD thru gearbox

GRINDERS

#2 BROWN & SHARPE Univ., factory AC MD
#3 ABRASIVE Surface, AC MD
#25A HEALD Rotary Surf., AC MD
10"x24" LANDIS Type C Univ. Hydr., new 1943

BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
#31 LUCAS Horz., AC MD
#43 LUCAS Horiz., AC MD, 4½" bar, 20' betw. faceplate & outer support
38" KING Vert. Boring Mill, AC MD
42" BULLARD "New Era" V.T.L., AC MD

GEAR MACHINERY

#12H GOULD & EBERHARDT Hobber, AC MD
#18H GOULD & EBERHARDT Hobber, AC MD
#34 BROWN & SHARPE Hobber, AC MD

TURRET LATHES

#4-W CINCINNATI ACME Univ., AC MD, thread chasing
#4 GISHOLT Univ., AC MIB, "Preselector", new 1942
#4 WARNER & SWASEY Univ. Grd. Hd., AC Mtr. in leg
#5 WARNER & SWASEY Univ. Grd. Hd., AC MD

MISCELLANEOUS

#4 WATERBURY-FARRELL Thread Roller, AC MD
2½" LANDIS Double Head Bolt Threader, AC MD
10" PRATT & WHITNEY Vert. Shaper
10' x 16 ga. CHICAGO Steel Leaf Brake, AC MD
5½' x 16 ga. VERDIN KAPPES & VERDIN Press Brake, AC MD

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48" Colburn Heavy Duty Vertical Boring & Turning Mill, Power Rapid Traverse

24" Bullard Vertical Turret Lathe, New Era Type, Motor Drive

Nos. 2-36 & 5-42 Cincinnati Vertical Duplex Hydro-Broaching Machines; MD

Excello and Heald Diamond Boring Machines, Double Spindle, Single End, Late Type

No. 13 Gleason Universal Gear Testing Machines, Motor Drive, Late Type

No. 35-L Excello Thread Grinder, Late Type, Refrigerated Coolant Tank

No. 13 Brown & Sharpe Universal Grinder, Late Type, Motor Drive

No. 4 Cincinnati Universal Mill, Motor in Base, Rectangular Overarm

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#206-F Toledo 135 Ton D.C. Press, 3" Stroke, 20" x 110" Bed Area
¼" x 144" Dreis & Krump Squaring Shear
Roller Type Slab Miller 22" Slab capacity
12 Spindle Meline Automatic Drilling Machine
3 spindle Meline Model 7-D Cylinder Borer
1 -A W&S Universal Turret Lathe
36" x 14' Schumacher & Boye Engine Lathe
Libby 26" x 4½" spindle Turret Lathe
#33 ExCello Thread Grinder
Lees Bradner CT 36" Thread Millers
10" x 48" Roll Grinder
300' Air Compressor, Ingersoll Rand, 50 HP Motor Drive.

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AUTOMATICS

#0G B & S, late type
1⅛" & 1⅝" B Spdl. Cone, late
9/16", 1", 1¼", 1⅝", 2", 2¼", 2⅝" Acme Gridleys, late
2¼ & 2⅝" Cone 6 Spdl., late
12" and 16" B Spdl. Bullard Multaumatics, late

PRESSES

2000 ton Bliss Hydr., 3 col. type, 12" str., 50½" sht. ht., dia. bed 115"
60 ton Dbl. Crank, 8" stroke, 48x24 bed, late model Waterbury Farrel
90 ton Dbl. Crank, 8" stroke, 48x18 bed, late model Bliss
35 ton 4, 5, 6" stroke, latest type, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke 21 x 27 bed, 110 strokes per min., Bliss, latest type
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late type
Inclinable, New, 20 to 70 ton, immediate delivery
375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 36x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 40" stroke
#305 Bliss, 12" stroke, late

TURRET LATHES

#3 & #5 Warner & Swasey, late type, lots of tooling
#4FU Fastermatic, 4" cap., late type
#3HB Libby Sliding Bed Gap, 8¼" cap., late type

MDNA MEMBER
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BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 Jaw
6" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3½" & 4" Landis Floor Type Mills
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support
48"x20' centers N.B.P. Lathe, Grd. Hd.
36"x32" bed Niles Lathe, 2 carr., T.A.
7' Carlton 17" col. Radial, 1943
Nos. 5, 4, 3 & 2 W. & S. Turrets, Late
No. 4 Gisholt Univ. Turret Lathe, 1942
2⅝" Acme Gridley RB8, Automatic, 8 spin.
1⅝" Conematic, 8 spin. (4)
#4H—12" Libby Slid. Bed Gap (5)
36"x36"x12' Cinci. Hypro Planer, 4 hds., Var. Voltage, 1943
24"x24"x16' Ingersoll Planer Type Miller, 4 hds., 20 H.P. AC, M.D.
48" N.B.P. Slotter, Grd., Late
15"x¾" Wickes Rolls, M.D.
42" & 36" King, Side Hd., (2) '43
2½" bar #25T G & L Table, '43
16"/18¼"x54" cc Reed Pr., 1942
3' Foadick 11" col., late, 1943
#65 New Britain Gridley, 6 spin., '43
#36 Van Norman Miller, 1944
Index Miller, Univ., late
ML16 Duall Saw, late
14"x72" Cinci. Grinder, hyd.
#174 Heald Gap Int. Grinder
#26Y28 Bryant Int. Grinder

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Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
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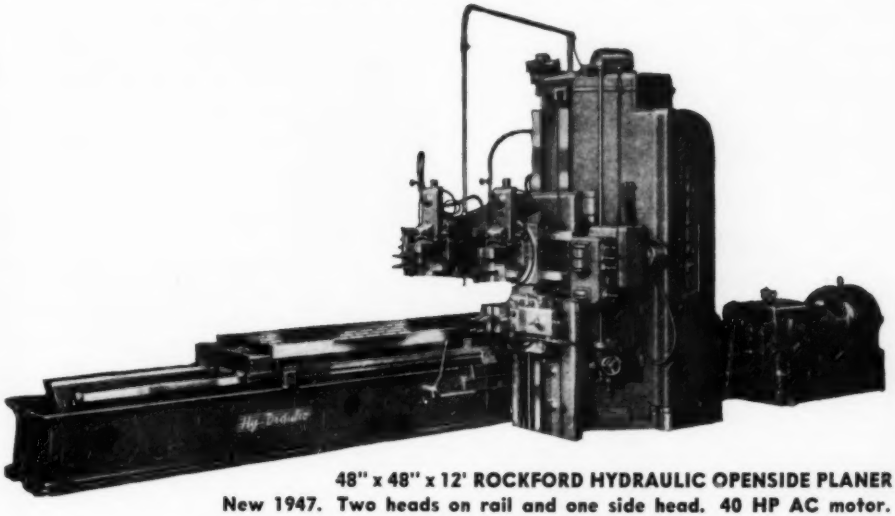

48" x 48" x 12' ROCKFORD HYDRAULIC OPENSIDE PLANER
New 1947. Two heads on rail and one side head. 40 HP AC motor.

BOREMATICS

#48A Heald Single End
#49 Heald Double End
#49 Heald Universal Single End

GRINDERS

#2 Brown & Sharpe Universal
#13 Brown & Sharpe Universal & Tool
6" x 15" J. & L External Thread
12" x 5" J & L Internal Thread
#2 Cincinnati Centerless
#95 - 86" Bridgeport Face

LATHES

14" x 54" Hendey Geared Head
20" x 48" LeBlond Geared Head
27" x 48" LeBlond Geared Head
25" x 120" LeBlond Geared Head
42" x 108" Niles Geared Head

SCREW MACHINES

Model #60 New Britain-Gridley Six Spindle
4⅜" Cone Four Spindle

MILLERS

#2 - 18 Cincinnati Plain Automatic
#4 - 38 and #5 - 48" Cincinnati Hydromatic
#1854 Kearney & Trecker Simplex
#2SP and #3SP Van Norman Plain
#26 Van Norman Ram Type Plain
#5H and #5HM Kearney & Trecker Plain
#3SU Van Norman Universal
#2 Cincinnati Dial Type Vertical
#2 Standard Brown & Sharpe Vertical
#3 Cincinnati Dial Type Vertical
#4 Reed-Prentice Vertical Miller & Die Sinker
4½" x 12" Pratt & Whitney Model C Thread
#10CT Van Norman Hydraulic Dual Head Contour

TURRET LATHES

#5U Foster Universal Geared Head
#1 and #4 Warner & Swasey Universal Geared Head
#1A Warner & Swasey Universal Geared Head
#1L Gisholt Universal Geared Head
#7A J & L Universal Geared Head

J. L. LUCAS & SON, INC.

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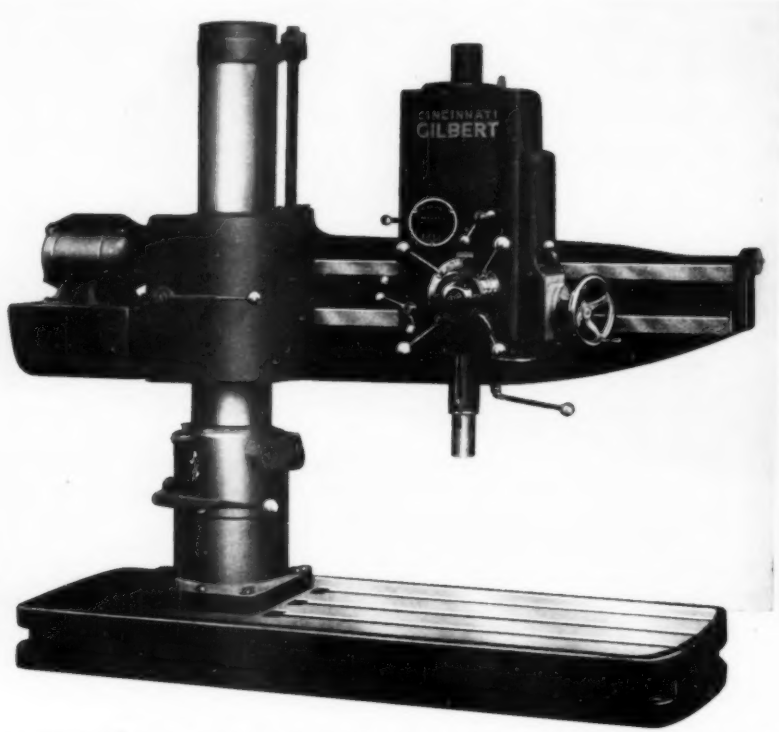

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6. **Balanced head on arm for easy movement.**
7. **Full bearing support for spindle, even when fully extended.**
8. **Anti-friction bearings throughout.**
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11. **Unit construction and interchangeability of parts for easy maintenance.**
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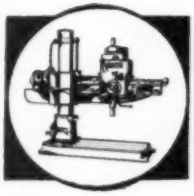

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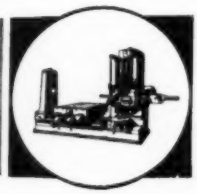

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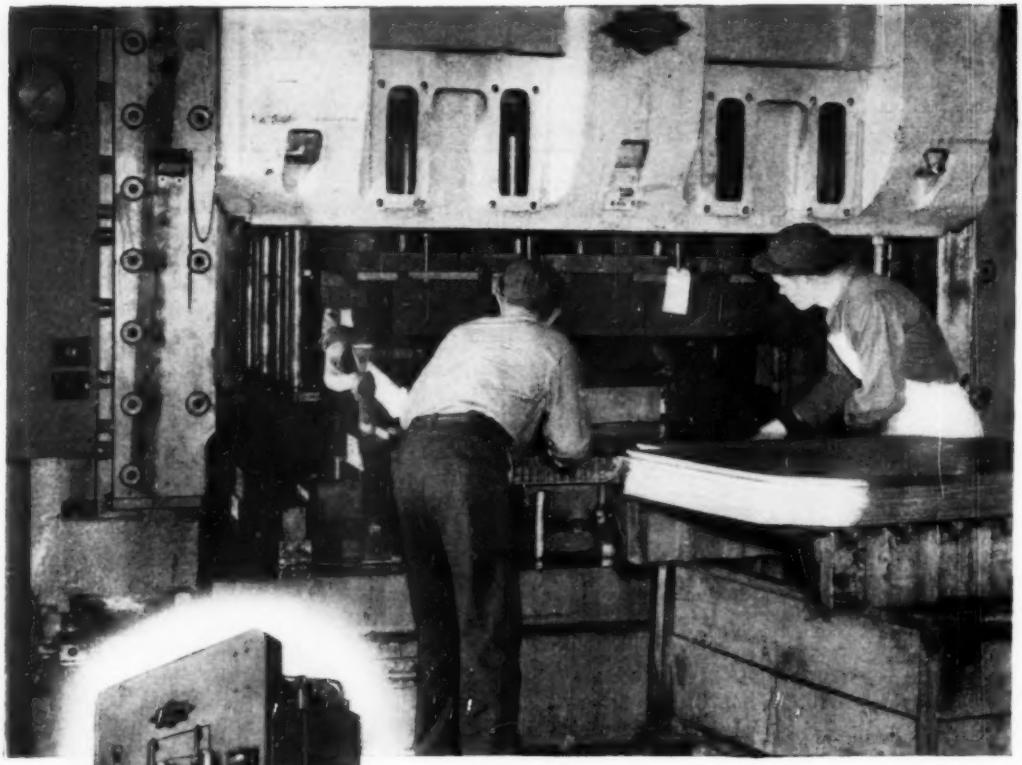

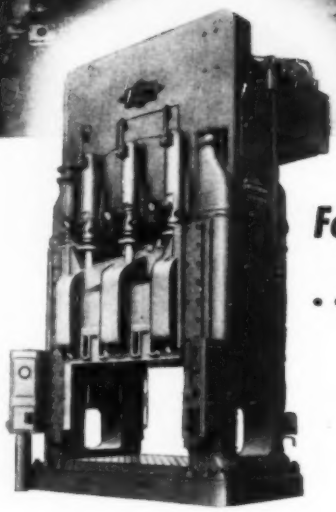

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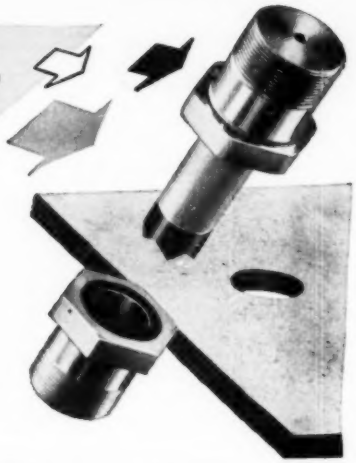

On a simple punching operation, this Carboloy punch and die lasted *12 times longer* than its steel predecessor!

In punching holes through abrasive Plaster Wallboard, steel dies wore .012" to .015" every 170 hours—

—while dies and punches of Carboloy Cemented Carbide show wear of only .0025" to .003" after 380 hours of continuous operation!

The Carboloy dies are bringing savings, not just in replacement *costs*, but in replacement *time*, as well.

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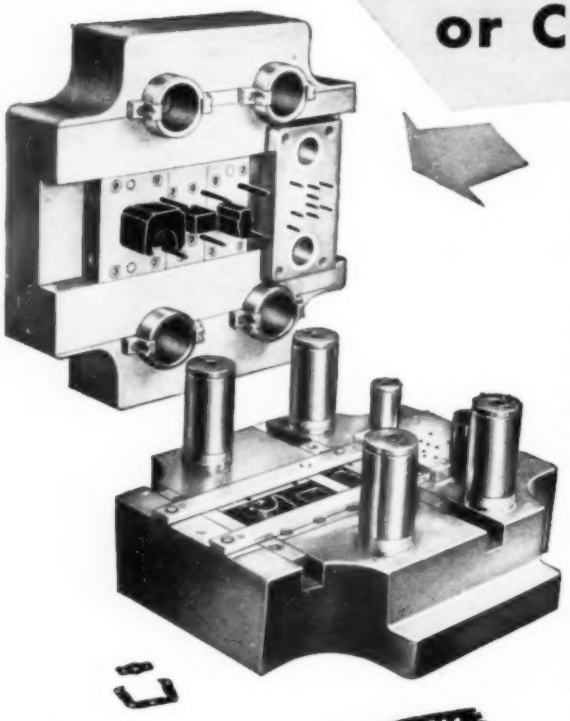

In complex dies, too, Carboloy brings the same longer die life, lower replacement costs and downtime, finer tolerances, better finishes.

This complex, five-station progressive die is an example. With unbelievable accuracy and efficiency, it produces millions of rotor and stator laminations.

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FOR GREATER PRESS OUTPUT

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CEMENTED CARBIDE DIES

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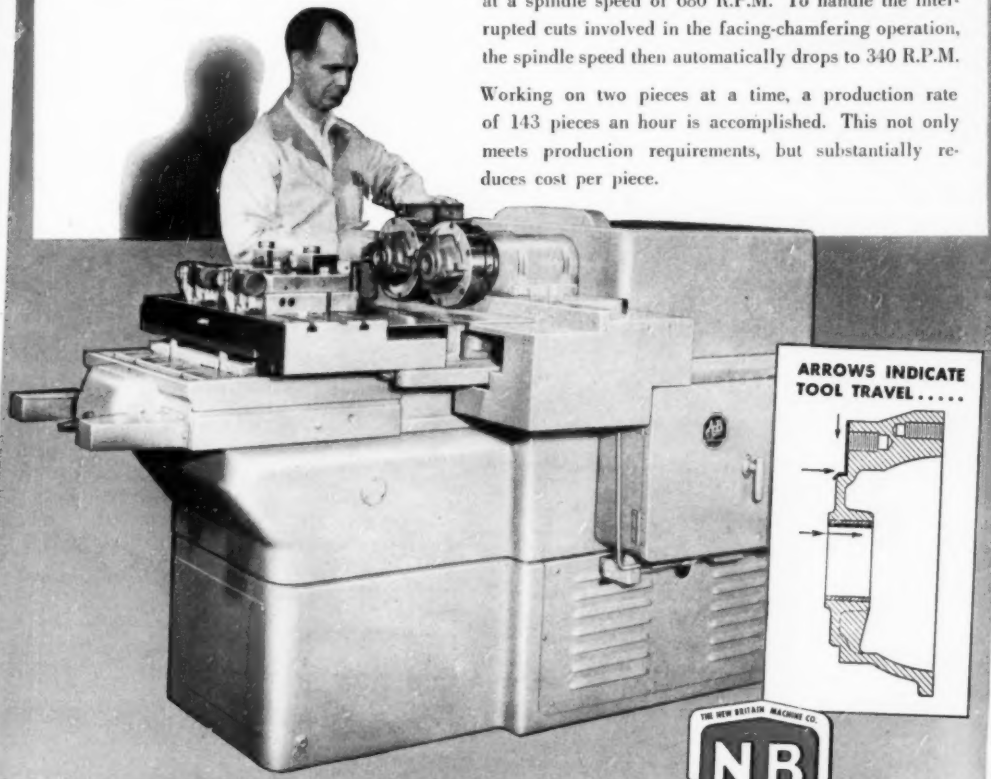
It first bores the I.D. of the shaft hole to ±.0005 tolerance and turns the O.D. of the shoulder to ±.0007 at a spindle speed of 680 R.P.M. To handle the interrupted cuts involved in the facing-chamfering operation, the spindle speed then automatically drops to 340 R.P.M.

Working on two pieces at a time, a production rate of 143 pieces an hour is accomplished. This not only meets production requirements, but substantially reduces cost per piece.



If your work involves any precision, contour or straight, boring and turning operations . . . look into these New Britain high production units.

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"DOUBLE-ZERO" BEARING IS A "GENERATED UNIT ASSEMBLY"

To achieve the extreme accuracy of the "Double-Zero" bearing, Timken engineers built specialized machine tools, developed measuring devices of extreme accuracy, and perfected new manufacturing processes.

Then, to assure positive roll alignment, long lasting precision, permanent adjustment, and smoother operation, the "Double-Zero" bearing goes through an extra step in manufacture. A natural and true geometric contact is generated between all rotating parts, which results in a "Generated Unit Assembly".

The new "Double-Zero" bearing is the latest example of Timken leadership in serving the bearing needs of all industry. Whenever you buy bearings, it pays to look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

A PRECISION TIMKEN BEARING FOR EVERY REQUIREMENT			
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RUN-OUT	.000075"	.000150"	.000300"
TYPES AVAILABLE	Standard Single Row	Standard Single Row	All types
SIZE RANGE	Up to 10" O.D.	Up to 12" O.D.	Up to 12" O.D.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

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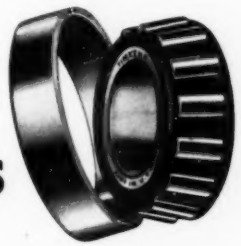

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